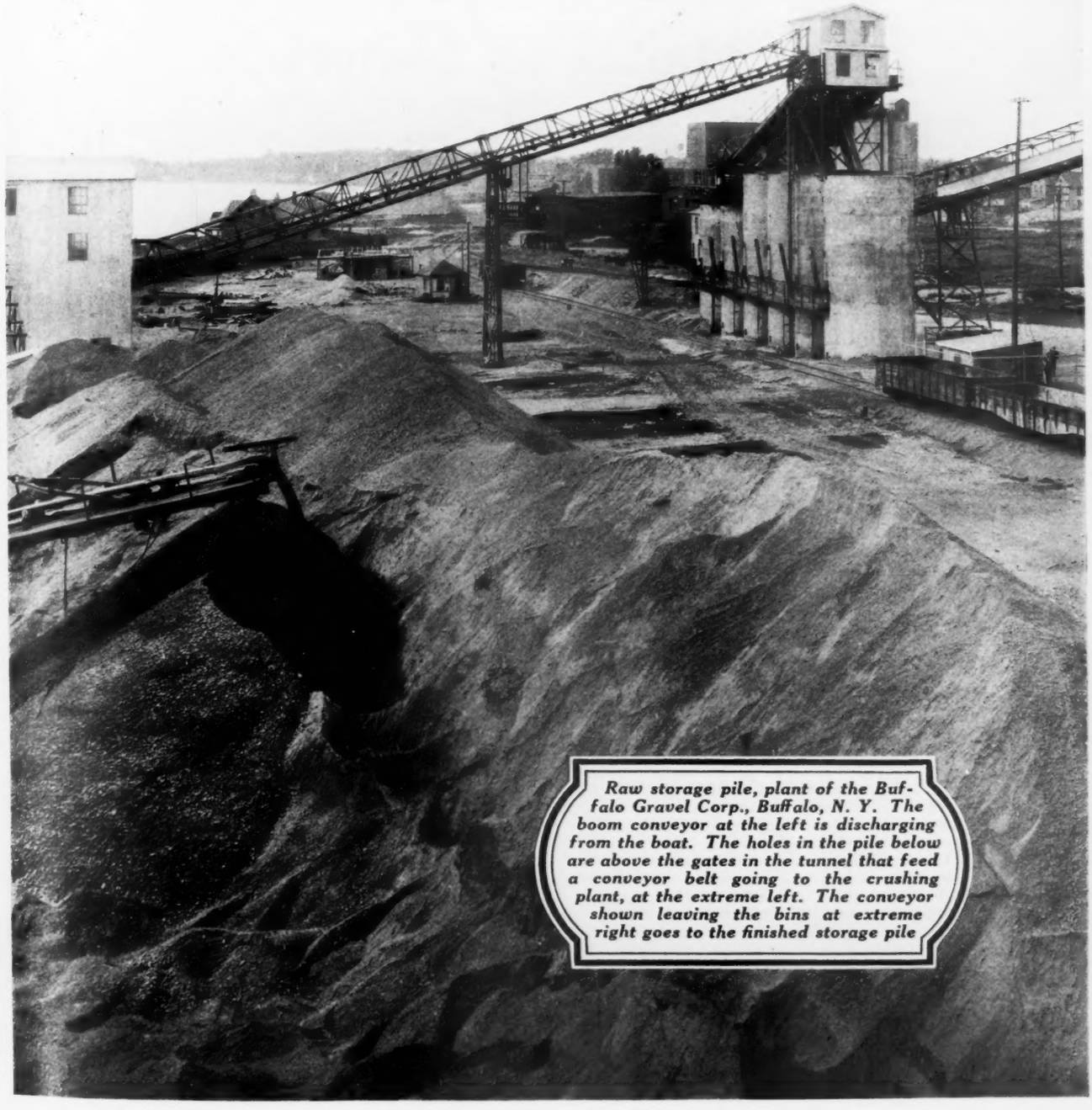
Volume XXX Chicago, August 6, 1927 No. 16

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896



Raw storage pile, plant of the Buffalo Gravel Corp., Buffalo, N. Y. The boom conveyor at the left is discharging from the boat. The holes in the pile below are above the gates in the tunnel that feed a conveyor belt going to the crushing plant, at the extreme left. The conveyor shown leaving the bins at extreme right goes to the finished storage pile

The conveyor for loading boats is at the left; the storage conveyor is in the center, and the washing plant and bins are at the right. The crushing plant shows in the background

Buffalo Gravel Corp. Has Unique System for Handling Materials

Raw Material Is Received by Lake Carriers and the Products Are Loaded Out for Boat, Truck and Railway Shipment

THE plant of the Buffalo Gravel Corp. which was recently completed in Buffalo, N. Y., is the most important plant of its kind to be put in production in 1927. It is also noteworthy for the operating methods employed. It is usual with sand and gravel plants to have the material dug near at hand and brought to the plant about as fast as it is dug. In the Buffalo plant the material is dredged from Lake Erie and brought in on barges or on steamboats provided with self-unloading devices. With either, the plant must be prepared to receive and store approximately 8000 tons of raw material without interrupting other work. As shipments are made, as well as received, in these large lake carriers, the plant must be equally able to load out heavy tonnages without either interfering with production or delaying the boats. The significance of this latter condition may be realized when one remembers that the cost of operating one of these big boats may run to $100 per hour in the busy season of the year.

The plant is built on an irregular shaped piece of land on the Buffalo docks on Niagara river and not far from the heart of the city. On one side is the dock line and on the other side the railroad. On one end is a public road over which truck deliveries may be made and at the other end ground which is reserved for future storage. The shape of the land and the necessity of accommodating the handling and storage of crude and finished materials to a limited area caused the layout to be studied more intensively than is usually necessary for a sand and gravel plant. The layout finally adopted put the crude storage on the dock, the finished storage along the railroad (although it is not used for loading cars) and left a space between in which the plant with its service tracks is placed. Ample space was left for maneuvering cranes and a roadway for trucks.

The self-unloading boat "Lakewood" discharging its cargo to the raw storage pile. Crane for unloading barges shows in the background

The self-unloading boats, one of which is shown in the pictures, have bins for receiving the sand and gravel on both sides of two tunnels, one on each side of the keel. These bins are filled by pumping with a 20-in. dredge pump. A 4 cu. yd. Sauerman "Crescent" scraper is drawn back and forth in each of these tunnels by lines that run to a hoist in the hold. The bucket comes out of forward end of the tunnel to an incline, and runs up the incline

and discharges into a hopper over the end of a conveying belt which carries the material up out of the hold and discharges onto an outboard conveyor belt. This outboard belt is supported on a boom frame and extends over the dock to a storage pile. It can be raised to build the pile to a considerable height.

Barges are unloaded to the storage pile by a traveling crane running on a 15-ft. gage track that extends the length of the dock.

Below the storage pile is a 30-in. belt conveyor 365 ft. long. For 250 ft. it runs underground in a concrete tunnel. Then it passes through a short curved section with 250 ft. radius to an inclined portion from which it discharges its load in the upper part of the crusher house. The belt is fed by segmental type gates on 7-ft. centers, which are placed in the roof of the concrete tunnel.

The raw storage pile as it is built by the self-unloading boats

Water side of raw storage pile showing boom conveyor and unloading equipment on the deck of the boat

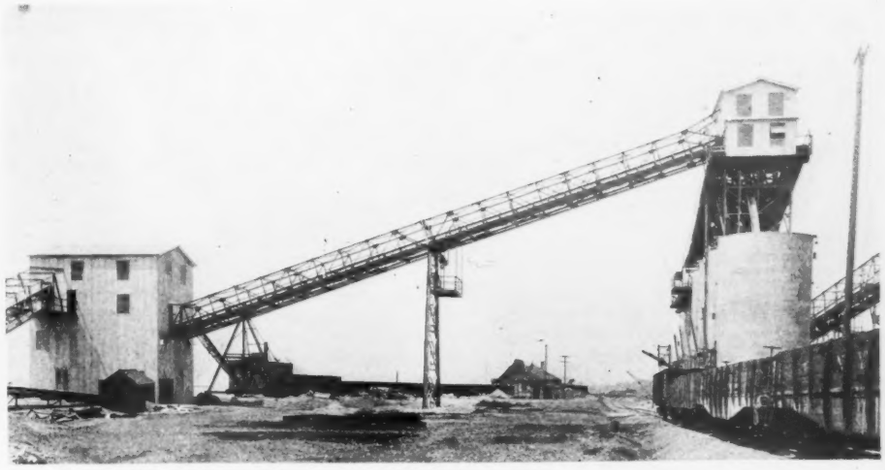
The belt discharges into a scalping screen placed in the uuper part of the crusher house. It is a 60-in. "stone screen," 16 ft. long having trunnion bearings. There is only about 3% of the material that will not pass the 2½-in. openings of this screen. This oversize is sent to an 8-in. McCully gyratory crusher which is direct-driven by a General Electric induction motor. This, as are all the other motors in the plant, is supplied with Allen-Bradley full automatic controls. The single crusher easily handles the oversize received at present, but in case conditions should make it necessary to handle a greater quantity, space has been left for the installation of a second crusher.

The crusher discharge passes to a 24-in. conveyor (marked as B in the drawings) which discharges on the first conveyor at a point near where it leaves the tunnel. In this way, the crusher discharge is returned to the screen.

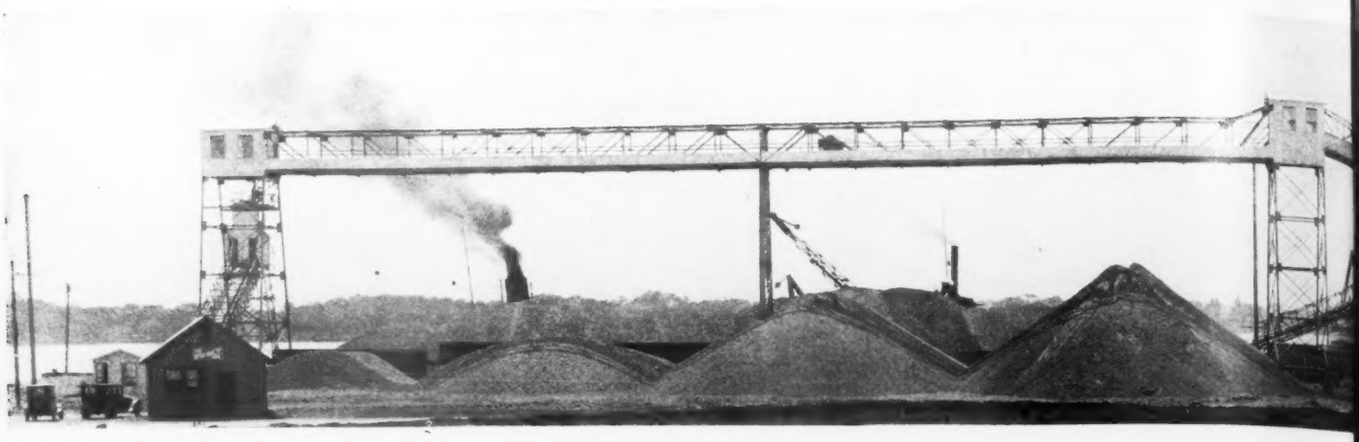
The undersize of the screen (all passing 2½-in.) goes to a third conveyor which is 172 ft. long and rises to a point 67 ft. above the ground, where it discharges to the washing plant. It is carried on a steel truss with a single support. It discharges into a partitioned box. On one side of this partition is a single spout that leads into a bin for storing pit-run material. On the other side are two spouts, each leading to a line of washing screens.

Each line of screens contains three Link-Belt conical screens of the largest type made, 8 ft. long, 72-in. dia. at the large end and 36-in. dia. at the small end. All but the sand screens have round holes, the first two 1¼-in. dia., the second two ⅝-in. dia. and the last two, the sand screens, ¼-in. by ½-in. slots. The oversize of the first two (between 2½ in. and 1¼ in.) and all the intermediate sizes go to bins. The undersize of the sand screens goes to two sand recovery boxes.

These boxes are especially designed for this plant. They are of the drag type, the sand being dragged out of the water by flights carried on a chain. This chain is 27 ft. center to center of the sprockets and the box is 7 ft. deep. Each flight has a slight kink in it to give better drainage, an



Crushing plant and conveyor to the screening and washing plant which is erected on the bins



Panorama of plant showing the 240-ft. storage conveyor. This is fed by the inclined conveyor that runs back to the

invention of H. A. Stelley, the plant superintendent. The chain is of manganese steel selected to resist wear. The top side of the chain is the tight side.

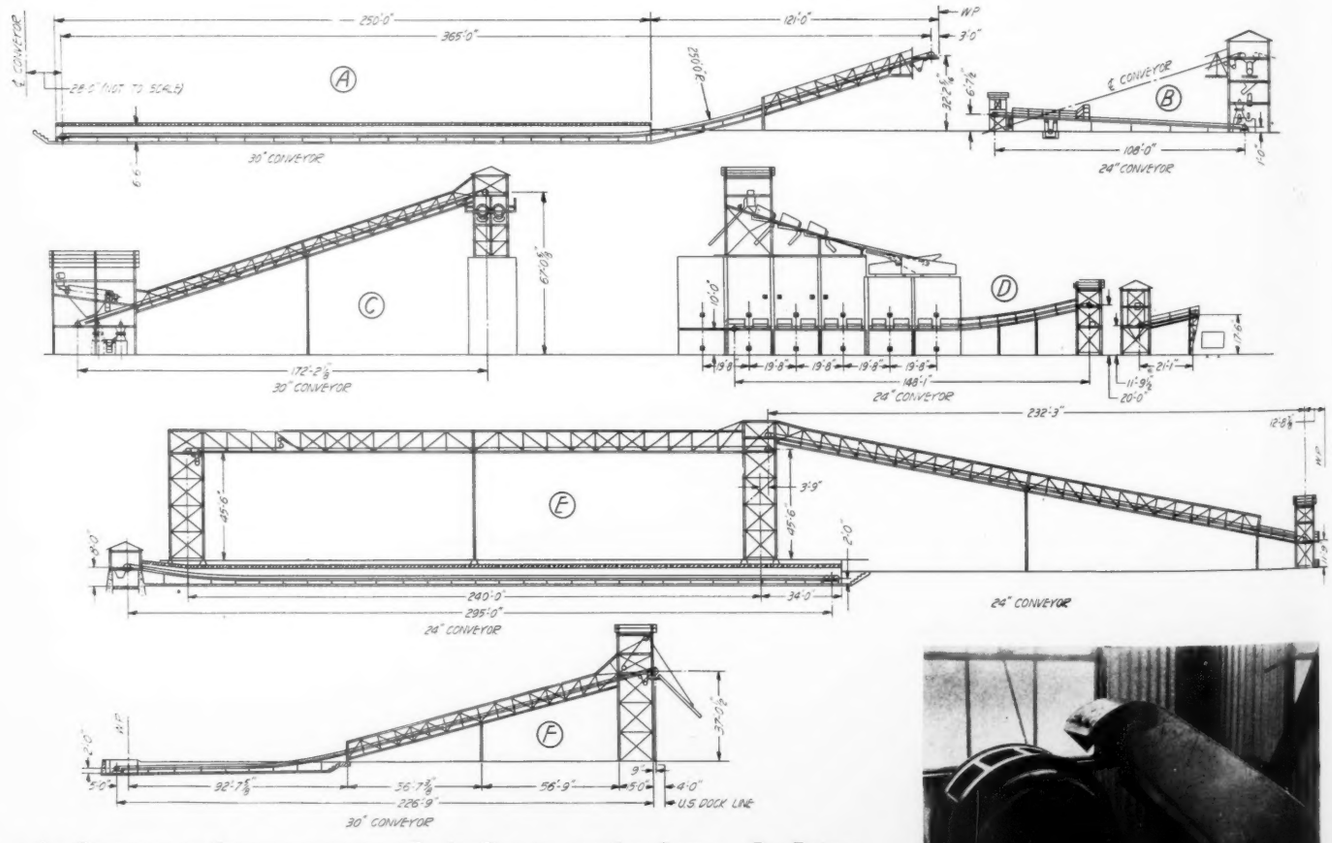
The sand and water from the screens pass over a perforated plate in the bottom of the launder that feeds the sand boxes, which makes a rough separation of the sand into fine and coarse. The quantity of fine sand taken out may be varied, if this should be necessary, by blocking off a part of the perforated plate or increasing its size. One of the sand boxes takes the coarse (concrete) sand, the other the fine sand used for plastering, brick laying and the like.

The boxes are set to draw out the sand in opposite directions so that each may discharge into its own bin. The waste water overflowing from the sand boxes is sent to an abandoned slip to settle out any solids before the water enters the river.

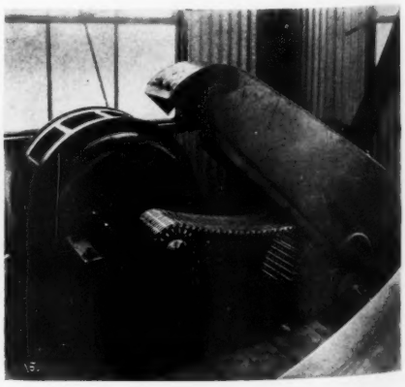
All the drives in the washing and crushing plants are either silent chain or cut gear trains. All machines have individual motors of General Electric make.

The bins are concrete silos, 18 ft., 8 in. inside diameter. The four gravel bins are 40 ft. high and the two sand bins are 32 ft. high. The bins stand between the railroad side track and the road on which trucks drive in to be loaded, and gates are placed on both sides. The gates on the truck loading side also feed the belt conveyor that takes material to storage.

On the railroad loading side there is a steel walkway on which the men stand to handle the spouts and gates. The spouts are long, to reach the center of the car, and



A—Conveyor under raw storage pile leading to crusher house. B—Return conveyor for crusher discharge. C—Conveyor from crusher to washing plant. D—Conveyor from bins to storage conveyor and short conveyor for loading mixed sizes. E—Storage conveyors for boat cargos. F—Conveyor for recovering from storage and loading boats

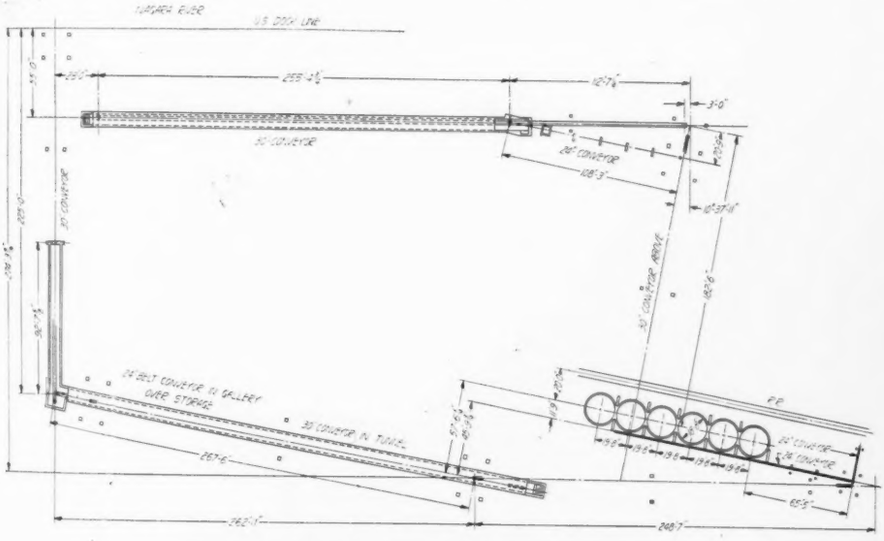


Type of drive used on screens, sand boxes and conveyors

house in the rear where it receives material from the conveyor that runs on the other side of the concrete silos

they can be raised and lowered by the usual ropes and counterweights. The gates are Link-Belt segmental type gates, the spring closing type being used on the sand bins. Cars may also be loaded from the storage belt through a short cross belt that runs to a frame supporting a swinging spout by which the material is spread the full width of the car as the loading proceeds.

On the truck loading side of the bins there is also a steel walkway but this is on cantilivered supports to leave a clear space below for the trucks. This walkway also supports the 24-in. belt conveyor (D) that runs to the storage pile. The pit run bin is not arranged to discharge on the belt, but all other bins discharge on it so that any size or mixture of sizes may be sent to storage or loaded into cars by the short cross belt previously mentioned. This cross belt is always used when a mixture



General plan of plant and conveying systems

The two-way chutes for loading to trucks or to the storage conveyor

Car loading side of bins. Note short conveyor for loading mixed sizes in the rear

Truck loading side of bins. The conveyor which takes material to storage is on this side

Screens and sand boxes. Note "kink" in the sand box flights

of sizes is to be loaded into railroad cars.

The gates on this side of the bin are fitted with a neat arrangement of spouts by which material may be sent either to trucks to be loaded or to the belt.

The storage belt, 148 ft. long, terminates in a small house, which protects the motors and gear drives of the belts. It discharges there on to either the cross conveyor for car loading or on to the inclined conveyor that leads to the finished storage piles. This inclined conveyor is 232 ft. between centers (horizontally) and rises to a point 55 ft. above the ground. It discharges on a horizontal conveyor 51 ft. above the ground and 240 ft. long which is in a gallery supported at the ends by steel towers. The storage piles are built below the gallery, the belt being provided with a tripper so that it can discharge at any point.

Below the storage pile is a concrete tunnel in which the belt that recovers the stored material runs. This is 295 ft. between centers. It discharges on another conveyor which is 226 ft. 9 in. long and 93 ft. of this length is in a tunnel, almost at right angles to the tunnel under the storage. After leaving the tunnel this same belt rises 37 ft. to a discharge spout supported by a steel

The house at the left contains drives for the storage conveyors

The flumes for the sand boxes. Note perforated plate in the broad flume

Looking from the plant over the storage conveyor and washed material stockpiles

Conveyor which recovers material from the stockpiles and loads it on boats

tower set close to the dock line. The spout is 24 ft. long so that it can reach to the center of vessels that are to be loaded. Boats are loaded by the belt system described at a rate of 500 tons per hour.

Reference to the plan shows that this loading point has been so placed that vessels can be loaded without interfering in any way with vessels that are being unloaded to the unwashed material stock pile.

Water for washing is pumped 156 ft. (vertical) by two 6x8-in. Gould pumps, driven by 50-hp. motors, each delivering 1100 g.p.m. through a single 10-in. line.

The belts which bring in the raw material and load the boats are 30-in. wide. The others are 24-in. wide. They are all supported, where they are above ground, on steel structures designed by the Link-Belt Co. The idlers on all of the conveyors are Link-Belt anti-friction idlers. All belts are provided with gravity takeups, except No. 7, which is provided with screw takeups, and all motor drives are protected from the weather by housing or covering.

The plant was designed by C. S. Huntington, engineer of the Link-Belt Co. in collaboration with H. A. Stelley, the plant superintendent. Its normal output is 200 tons per hour.

The office of the company is at 19 Hudson street, Buffalo, N. Y. D. Hyman is president; S. J. Dark is vice-president; F. X. Ernst is secretary, and R. W. Eberly is treasurer, and H. A. Stelley is in charge of operations at the plant.

New York State Stone Producers Inspect New Dolomite Products Co. Plant

Rochester, N. Y., Meeting One of the Largest in the History of the New York State Crushed Stone Association—A Crushed Stone Plant Without an Elevator or a Cylindrical Screen

By Nathan C. Rockwood
Editor and Manager, Rock Products

SOME 70-odd members and guests of the New York State Crushed Stone Association derived both pleasure and profit from the mid-summer meeting held at Rochester and Manitou, N. Y., on July 22. For, aside from the spirit of goodfellowship and joviality which attends these meetings, an opportunity was enjoyed to inspect one of the newest, and undoubtedly one of the most novel, stone-crushing operations in the United States. This is the new plant of the Dolomite Products Co., about four miles west of Rochester on the New York Central main line. The plant will be described in some detail further on in this article.

Program

John H. Odenbach, secretary, New York State Crushed Stone Association, and president of the Dolomite Products Co., was host to the members and guests at a luncheon at the Odenbach restaurant in Rochester at noon. From there the party went to the Dolomite Products Co. plant and then to the Hotel Manitou, another of the Odenbach enterprises, on the shore of Lake Ontario. Here a baseball game and other sports were indulged in. The business meeting of the association followed a dinner at the Hotel Manitou.

President Geo. E. Schaefer, Rochester representative of the General Crushed Stone Co., presided. Brief addresses were made by Otho M. Graves, president of the National Crushed Stone Association; A. T. Goldbeck, chief of the bureau of engineering, National Crushed Stone Association; Howard Smith, division engineer, New York State Highway Department, Rochester district; Charles Waters, division engineer, New York State Highway Department, Buffalo district; George Powell, road superintendent, Ontario county; Robert Holmes, road superintendent, Wyoming county; Edward Miller, deputy commissioner of public works, Rochester; John Rice, past-president, National Crushed Stone Association; W. L. Sporborg, past-president, New York State Crushed Stone Association.

President Graves, of the National Crushed Stone Association, as usual, made an eloquent plea for a research laboratory for the association. A. T. Goldbeck, engineer of the association, discussed the needs of research in general. Howard Smith, of the New York State Highway Department, expressed the pleasure and benefit he derived from these contacts with crushed-stone producers through a better understanding of their problems. Chas. Waters, of the New York State Highway Department, gave some very interesting statistics to prove that there is no end in sight of the public demand for crushed stone. In the Buffalo district road pavements are being widened to 30, 40 and even 60 ft. A 40-ft. concrete pavement costs about $125,000 a mile, he

Members and guests of the New York State Crushed Stone Association at the Rochester meeting

said. The traffic limit of the former standard 18-ft. and 20-ft. concrete pavement, he said, was from 6000 to 8000 vehicles a day, and on the roads leading into many big cities this limit has long been reached. Mr. Waters endorsed the idea of a crushed-stone research laboratory. Mr. Powell, of Ontario county, noted that the quality of crushed-stone aggregate, particularly as regards cleanliness, was improving.

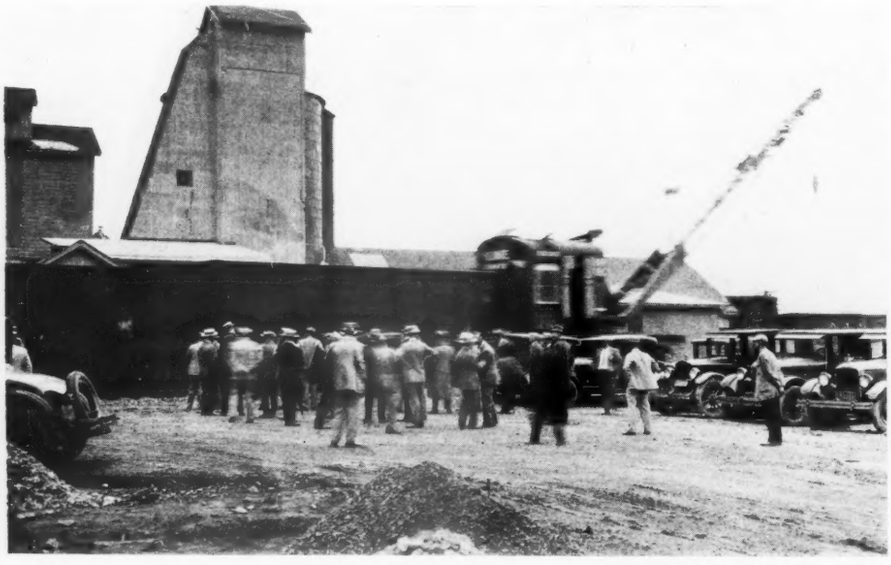
No further business was taken up other than to decide upon Clayton, N. Y., at the entrance to the St. Lawrence river and the Thousand Islands for the next meeting (August).

The original Dolomite Products Co. plant, which John H. Odenbach bought in 1920, was described in Rock Products as the plant of the Becker Limestone Co., Lincoln Park, N. Y., August 28, 1918. Those of a curious mind who would really like to see how a crushed-stone business may be developed by the application of brains and industry should compare this description of the new plant with that of the old one—which was new in 1918—bearing in mind that the new plant has been built and paid for out of the profits of the operation. Mr. Odenbach came into the quarry business from the restaurant business without any prejudices or confirmed opinions as to how the quarry business was or should be conducted. Being a real genius in things mechanical, and a very good business man as well, he commenced doing things more or less revolutionary in quarry and crushing-plant practice.

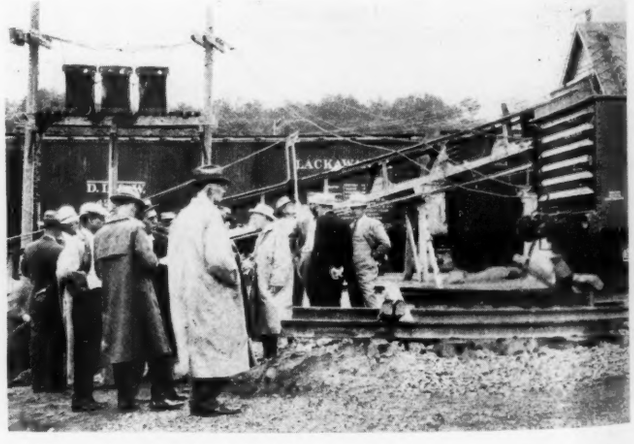
Inspecting the garage at the Dolomite plant

Mr. Odenbach was one of the first, if not the first, to replace locomotives and cars in the quarry with heavy-duty motor trucks equipped with specially designed bodies for handling shovel-excavated stone. Others had used smaller trucks. A description of this quarry operation and some of Mr. Odenbach's ideas for merchandising crushed stone were described in Rock Products, April 18, 1925; and the cost figures on handling stone by motor trucks published in that article had much to do with attracting the attention of other quarry operators to the possibilities of motor-truck transportation in quarries. Since then at several other quarries motor trucks have been adopted in place of industrial railways. The chassis of these motor trucks last indefinitely. The bodies are good for about 300,000 tons of stone each, according to experience at this quarry. The previous article, already referred to, also described some of the plans of Mr. Odenbach for the new plant he had started to build at that time. This new plant had been in operation about six weeks when inspected by fellow members of the New York State Crushed Stone Association; and all agreed that it was novel, quiet in operation, simple in design and thoroughly efficient. Many veterans complimented him highly for his ingenuity and his pioneering spirit.

There are three distinct elements in the



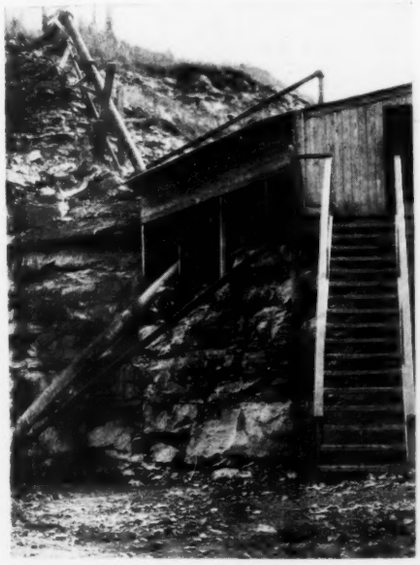
Members gathering at the Dolomite Products Co.'s operation. Part of the old plant shows in the background



Groups of members and guests inspecting the Dolomite Products Co.'s new plant

Dolomite Products Co.'s quarry. There are no tracks as trucks bring the stone to the crusher

plant, and they may be considered and described separately: (1) a closed circuit crushing plant; (2) a conveying and elevating unit; (3) screens and bins. The plant is practically unique in that it has but two

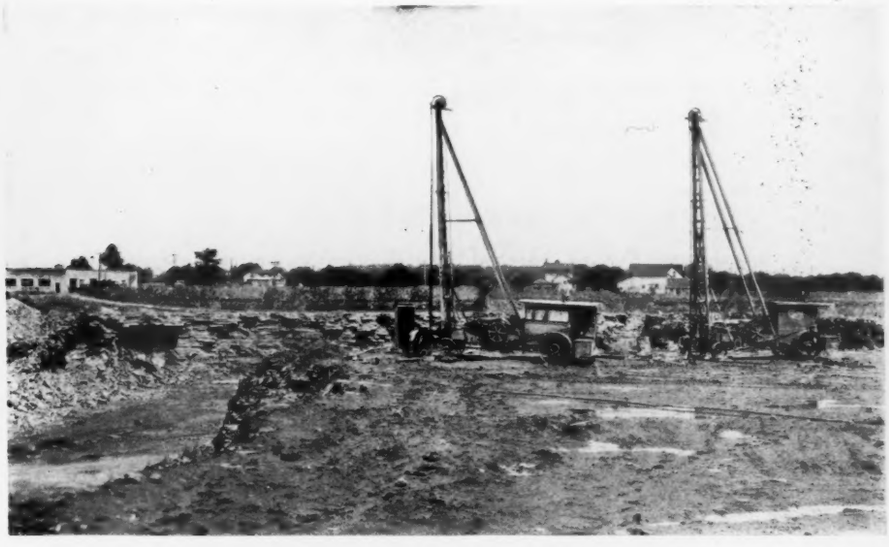


A 4-in. pump keeps the quarry dry and a 10-in. pump is in reserve

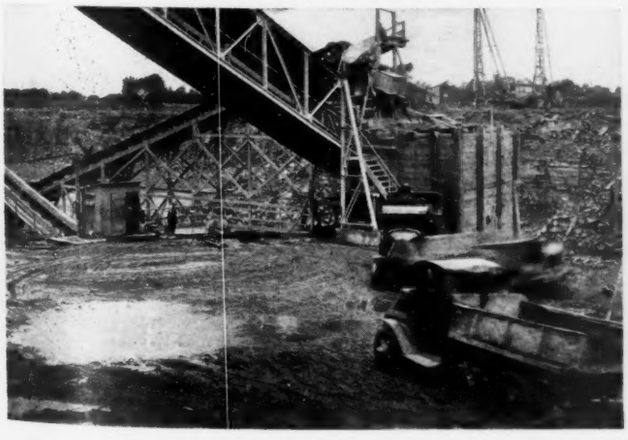
crushers, both of large size, for all reduction, a 42-in. Allis-Chalmers McCully primary breaker and a 16-in. Kennedy secondary crusher. (This Kennedy gyratory crusher, incidentally, is the only part of the older plant made use of.) The plant is unusual in not having a single elevator. And again it is wholly unique in not having a single rotary, or revolving, cylindrical screen or trommel. All the screening is done with the revolving-roll type screen, or roll type grizzly, as it is better known. Except for the crushing unit, which is in the quarry and in which changes are contemplated, all the new structures are steel and reinforced concrete.

A rough plan and elevation (not to scale) of the crushing unit is shown herewith. The dumping platform at the primary crusher is so arranged that two motor trucks may dump simultaneously into the primary breaker. (All roadways into and in the quarry are broad enough for trucks to pass.) If for any reason the primary crusher is down, the trucks may dump into the secondary crusher, which is set beside the primary crusher and at the same dumping level. The primary crusher is set to a 4-in. opening on the closed side. The secondary crusher is set to a 3-in. opening. The primary crusher output is about 60% of 4-in. size and under.

The stone from the primary crusher is raised 27 ft. by a 42-in. belt, 81-ft. centers,



Well drills working in stripped ground



The left-hand picture shows a truck coming in to the crusher, which is underground, and the right-hand picture shows the truck in dumping position

to the feeding hopper of another 42-in. belt conveyor, 93-ft. centers, which reverses the direction of flow of the material and elevates it 31 ft. to a hopper over a 200-ton bin. This hopper feeds a roll-type grizzly, 3x6 ft. in size, with six 12-in. rolls having 4-in. perforations, or spaces indented between the facing rolls. Everything that passes through this grizzly (3-in. stone and under) goes by gravity direct to the main 42-in. belt conveyor to the screening plant. All rejects, or over-size stones, go to the 200-ton bin feeding the secondary (16-in.) crusher by a gravity chute. The product of this crusher is delivered by a gravity chute back to the same belt conveyor that receives the output of the primary breaker.

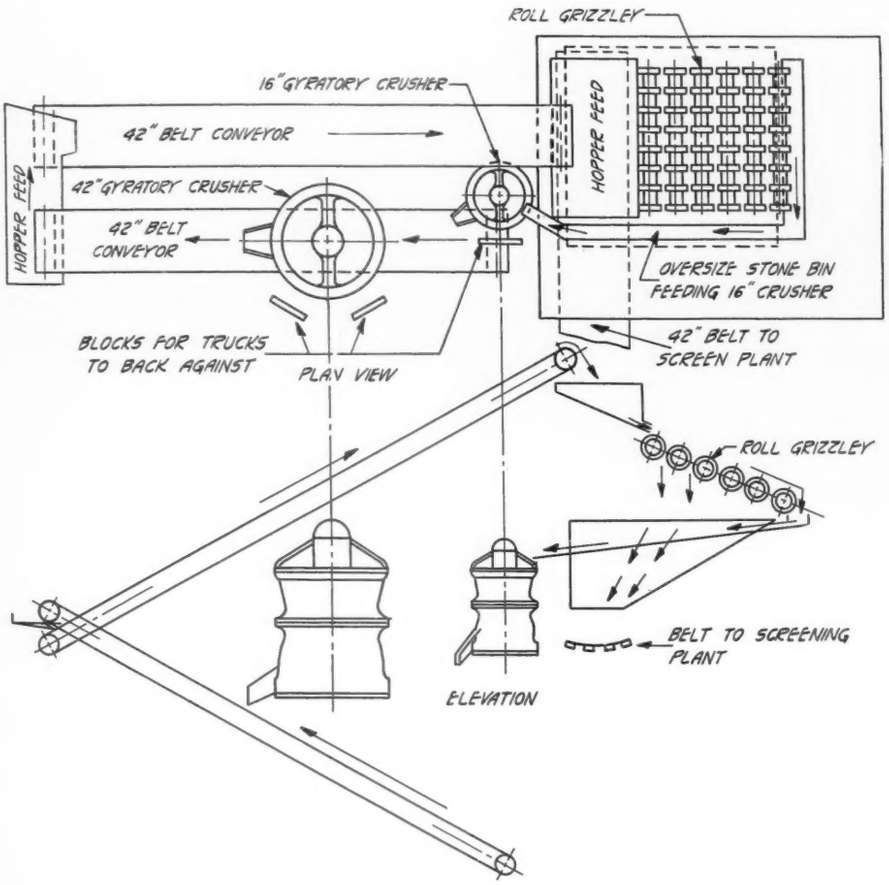


Diagram showing flow of material through crushers and scalping screen

A glance at this layout shows that the material circulates in an entirely closed circuit of crushing, conveying and scalping units, so that none but finished stone gets to the main conveyor to the screening plant. The actual capacity of the crushing plant has never been determined, but it has operated satisfactorily for short periods at as high as 800 tons per hour, according to Mr. Odenbach.

The 42-in. belt conveyor and structure from the crushing plant in the quarry to the top of the screening plant does not differ from similar installations other than in ruggedness and neat appearance. This conveyor is of 250-ft. centers and there is, as the views show, but one intermediate support between the crushing plant and the screening plant. The determination to use a single tower support rather than several bents was because of the improved appearance of the structure; so it is evident that Mr. Odenbach, who planned this structure throughout, is governed by aesthetic considerations as well as practical ones. The conveyor gallery is supported by four 8-ft. steel trusses from 130 to 85 ft. in length, which (as were the tower bents) was fabricated and erected by the Genesee Bridge Co., Rochester.

The conveyor gallery is covered on the north side and roofed with corrugated asbestos-cement siding. It is lighted with electric lamps and has a 3-ft. walkway on the open side.

The total elevation of the stone from the crushing plant to the screening plant is 84 ft., so the conveyor is unusually steep for such installations (about 20 deg.).

At the top of the screening plant (a rough plan and elevation of which is shown herewith) the belt conveyor discharges to a roll-type grizzly or screen, which passes the sizes less than 1½-in. The oversize continues over two more roller screens, in series, the first screen making 2½-in. stone, the second 3-in. and rejecting the 4-in. The finer sizes which have passed the first roller screen, as mentioned, are taken from a gravity feeder or chute under this screen by

End view of oversize bin

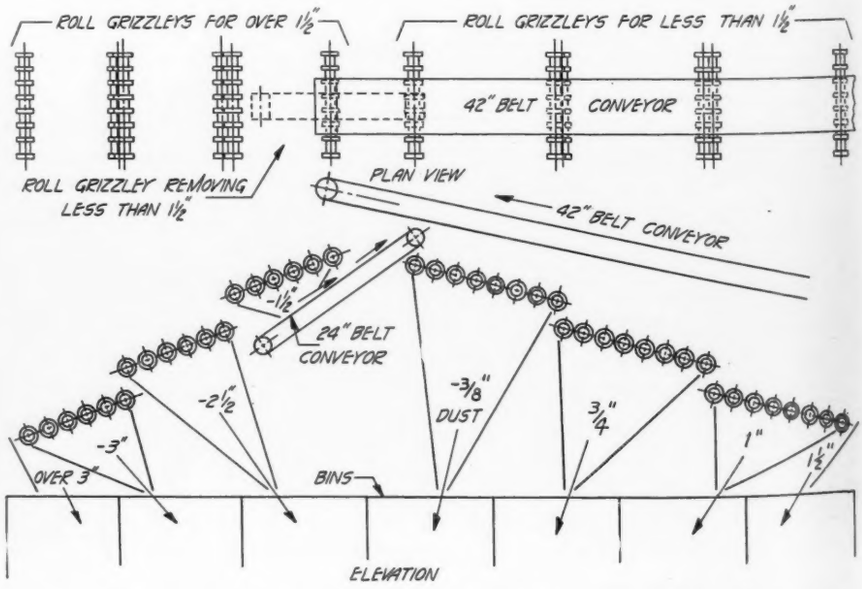


Diagram of the flow of crushed material through coarse and fine roller screens

The crushing plant is in the quarry and a 250-ft. belt in a steel trussed gallery connects it with the screening plant

a short (10-ft. centers) 24-in. belt conveyor, located under the main 42-in. belt conveyor, to a series of three roller screens which first remove the dust, or screenings, and in succession make the ¾-in., 1-in. and, by rejections from the last screen, the 1½-in. sizes of stone.

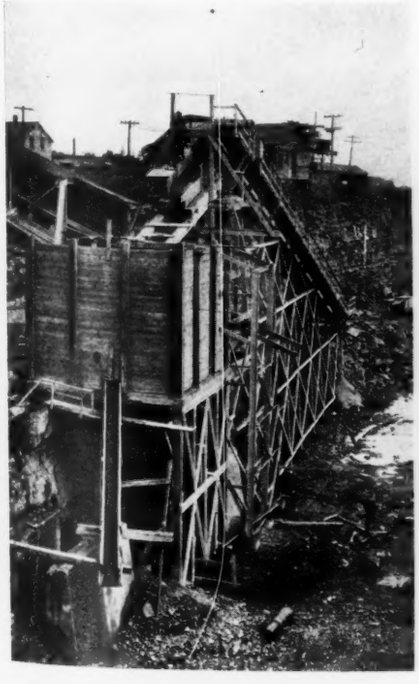
Roller Screens

All seven roller screens and grizzly were designed by John H. Odenbach, and built in Rochester for him by the Willsea foundry and machine shop, Rochester. The scalping grizzly, as already described, is 3x6 ft., with 12-in. rolls. The screens for sizing the stone vary, 42-in. wide to 21-in. wide. All of them are 6 ft. long. The main diameter of the rolls on the larger sizes is 12 in. (6 rolls) and on the smaller sizes 6 in. (10 rolls). The rolls and the side plates are made of special manganese steel cast by the Willsea works.

The angle of incline on the various screens is a little different. On the scalping grizzly it is about 18 deg.; it is 20 deg. on the larger sizes of the sizing screens and about 15 deg. on the smaller sizing screens. This is obviously something which must be determined largely by experiment.

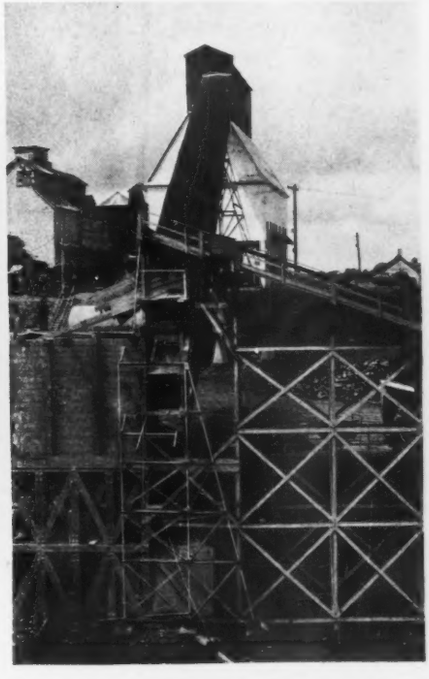
The belt conveyor and screen layout over the bins requires about 14 ft. of free headroom. The overall width of the entire screening plant is 5 ft. and the length 44 ft. This is, of course, very compact for a screening plant which Mr. Odenbach rates as capable of handling up to 400 or 500 tons per hour. The bin and screening building is only 40x62 ft. in plan, yet the depth of the bins is such as to give storage for 3000 tons of stone in seven sizes, including dust or screenings.

The details of the screens themselves are shown in the accompanying views. They differ from some of the standard screens of this type now on the market in the method of driving the rolls. The rolls have bronze bearings immersed in oil, which is circulated by an oil pump. It is intended to try out a heavier oil or grease. Each roll is driven at a different speed by a short worm, the



Oversize bin and primary crushing plant. The scalping grizzly shows above the bin

The screening plant, an excellent example of industrial building



Looking from below the crushing plant to the screening plant. Note old plant at extreme left

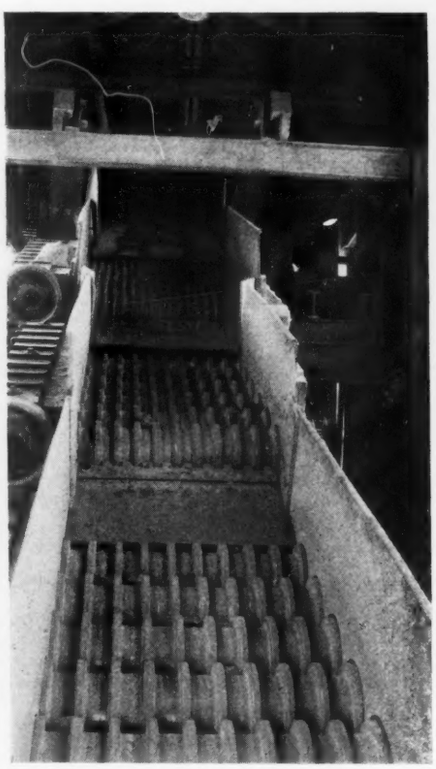
Conveyors of the crushing plant. The conveyor behind the trestle delivers the crusher discharge to the belt that feeds the scalping roller screen above the oversize bin

six or 10 worms for the six or 10 rolls, all being on a common shaft. The speeds of the rolls on the main grizzly vary from 74 r.p.m. at the top to 95 r.p.m. at the bottom. On the smaller sizes the speed at the top of each screen is 100 and at the bottom 125 r.p.m. This shaft is driven by a 7½-hp. Timken roller-bearing Allis-Chalmers motor in the case of the large grizzly, and 5-hp. and 3-hp. motors on the other screens, according to size. Texrope drives are used on all these motors. As shown in the accompanying views, the motor drives are at the low ends of the screens, but this is to be changed, with the motors at the top of the screens. The method of drive with worm and ring gears has been patented by Mr. Odenbach and these screens will doubtless be known as the Odenbach screens. On other screens of this same general type chain and bevel gear drives are employed.

End of conveyor, scalping roller screen and gate to secondary crusher

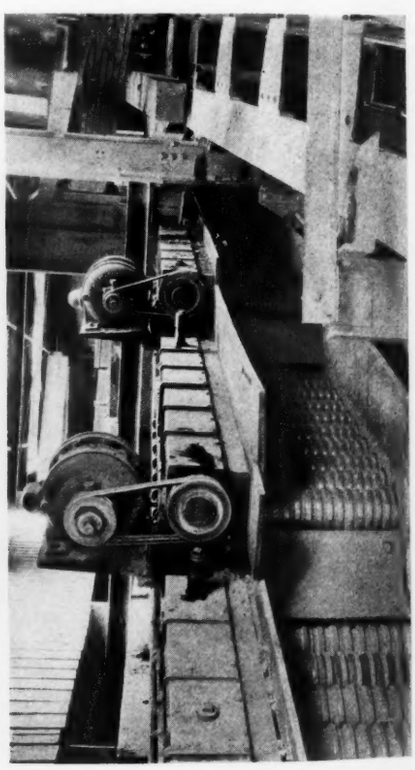
Other Details

The cost of a screening plant of this type is said to be from $200 to $250 per sq. ft. of screen area. However, practically every square inch of screen area is working, which of course is not the case with rotary screens.



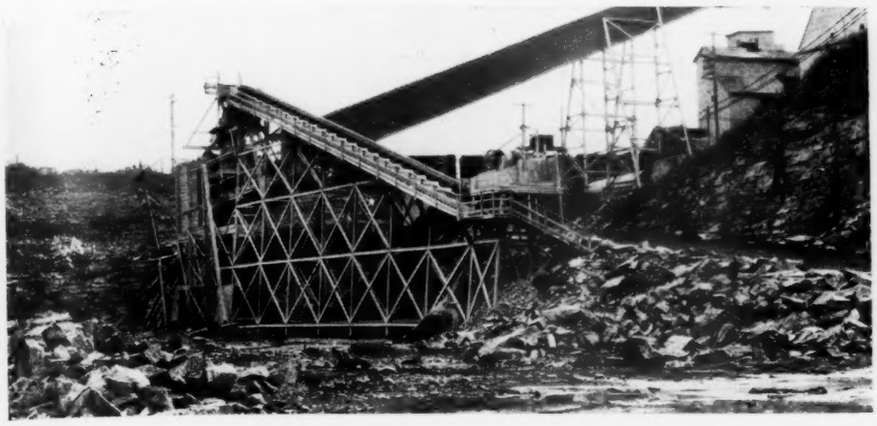
The series of roller screens which separates the coarser sizes

With the exception of the 24-in. belt conveyor for feeding the second series of sizing screens all belt conveyor details are standardized and interchangeable, including drive gears. The carriers and idlers are Brownhoist equipped with Timken roller bearings, and provided with Alemite lubrication. A 50-hp. Allis-Chalmers Timken roller-bearing



The roller screens which separate the finer sizes, with motors and drives

motor drives the 250-ft. main conveyor through gears and a Texrope drive. The theoretical horsepower required to lift 800 tons of stone 84 ft. per hour is about 67 hp., so it can be readily seen that the 50-hp. motor could not do its duty day in and day out unless friction is reduced to a minimum. Unfortunately the actual horsepower used has never been determined. The motors on the other two 42-in. belt conveyors are 20-hp. Allis-Chalmers roller-bearing, while the



This trestle supports the belt that takes the crusher discharge to the scalping screen

motor on the 24-in. belt conveyor is of the same type and of 3-hp. The primary crusher is driven by a 200-hp. Allis-Chalmers 3-bearing motor and the secondary crusher by a 100-hp. G.-E. motor. All motors and one of the quarry shovels are on a 220-volt, 60-cycle alternating current.

All motors have push-button control and are controlled through automatic switches, so that all units are stopped simultaneously either from the crushing plant or the screening plant, but each unit may be started and stopped independently. A signal system of electric bells connects the crushing and screening units. A telephone system is to be installed soon.

The total horsepower required in the crushing and screening plant, based on the motor ratings, is 347½ on the crushing and conveying unit in the quarry and 77 in the main conveying and screening units—a total of 424½hp. for a probable capacity of 700 to 800 tons per hour. The secondary crusher motor is larger than necessary, but the conveyor motor, as shown, is developing more than the rated horsepower. Probably 450-hp. would cover the needs of the plant proper, which is low for a plant of that capacity. Five men only are required to operate the plant. Two are stationed at the primary crusher, one at the scalping screen, one in the screen house and one for operating the bin gates.

In the quarry two electric well drills are used (Cyclone) and one Model 37 electric Marion shovel and one gas-electric shovel of the same make and size. The drainage system consists of one 4-in. Gould centrifugal pump driven by a 25-hp. G.-E. motor for ordinary service and one 1-in. Gould centrifugal pump driven by a 75-hp. G.-E. motor, for spring pumping out and emergency service. The 4-in. pump discharges 700 g.p.m. and the 10-in. pump 3600 g.p.m.

Additional equipment includes two locomotive cranes, the newest being a 25-ton gasoline Brownhoist for switching cars and stock piling.

As noted in the previous article in Rock Products, describing this operation, Mr. Odenbach has a very complete machine shop where he builds his own truck bodies and keeps his trucks constantly in A-1 operating condition.

Some other details in regard to his operation and plans will be published in a subsequent issue.

"Matt" (left) and John Odenbach

Road Show to Be Held in Cleveland in 1928

THE 1928 Convention and Road Show of the American Road Builders' Association will be held in Cleveland, Ohio, January 9 to 13.

After carefully considering invitations from several cities, it has finally been decided that the next convention of the Road Builders should be held in Cleveland on account of the many facilities that that city affords and which will permit of a larger and more interesting exhibit.

The exposition will be held in Cleveland's Auditorium and Annex, where every facility for a successful exhibition is to be found. There is available 45% more area than was used in Chicago, with facilities such as railroads tracks immediately adjacent to the exhibition building. With less expense to the exhibitor, a more satisfactory exhibit may be made and more space secured than in previous years. This lack of space during the past few years have been a severe drawback to the many exhibitors who have desired to show improved machines and materials that they were not able to exhibit in Chicago because of restricted space.

An excellent arrangement has been made with the convention board of the Cleveland Chamber of Commerce, by which all hotel reservations will be made through a central bureau, thus assuring everyone of satisfactory hotel accommodations. Definite and detailed arrangements as to how reservations should be made will be made public later.

The American Road Builders' Association at the present time is organizing a division of county officials, and one of the features of the 1928 convention will be County Officials Day, when papers and discussions covering the problems of county officials will be presented. The entire day will be given up to the activities of county officials and the officers of the day will be selected from county officials.

The great success of Pan-American Day, which was participated in by twelve Pan-American countries at the 1927 convention, has demanded that this day be observed at the 1928 convention, and extra effort will be made to have a larger number of countries represented. The Pan-American countries will be invited to send exhibits, and these, together with the exhibits presented by the several states, will form a special exhibit.

The Road Builders' Banquet has already grown to enormous proportions and in 1928 there will be a larger number of road builders than ever before at this yearly function.

In order to attract large numbers of people to the convention, a special program is going to be presented. One day will be given over to county officials problems, one day to the usual highway engineering features, and another day to traffic problems. A program setting forth the contractors' problems and progress will be held as usual.

With the knowledge that the next convention is to be held in Cleveland, many applications for space have already been received, although no formal applications will be received until August. This, however, is an indication of the great interest being shown by the various exhibitors, and with the greater amount of space available they will be able to make such an exhibit of the most improved equipment and materials that the exhibit will take on proportions of great educational value.

New Rock Asphalt Company

THE formation of the American Rock Asphalt Co. by a group of Huntington, W. Va., business men has been announced. The firm is incorporated for $100,000 and will develop asphalt deposits in Carter county, Kentucky. It was announced that mining and shipping of asphalt will start very soon.

William J. Wolfe is president of the corporation; Frank Duvall, vice-president, and Thomas A. Null, secretary-treasurer.—*Huntington* (W. Va.) *Advertiser.*

Recarbonization, Cause for Contamination of Lime in Kilns and Other Studies

The Carbon Dioxide Is Easily Re-absorbed Under Certain Conditions; Magnesium Oxide Does Not React in Similar Way—Suggests Method of Making Magnesium Oxide from Dolomite

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

THAT lime in a kiln could "breathe," inhale and exhale, may appear quite puzzling to many, but nevertheless this is easily possible and often responsible for poor lime quality. Of course ordinarily the lime exhales; the CO_2 gas being given off by the decomposing carbonates exudes outwardly through the surface. If, for any reason, temperature drops below that necessary for continued decomposition, the CO_2 within the lump will be re-absorbed, that is, it will return into the lime to again make carbonate or limestone. When this happens a vacuum forms in the lump, and to satisfy it gas from outside of the lump will rush in; and if this gas contains impurities, whatever they

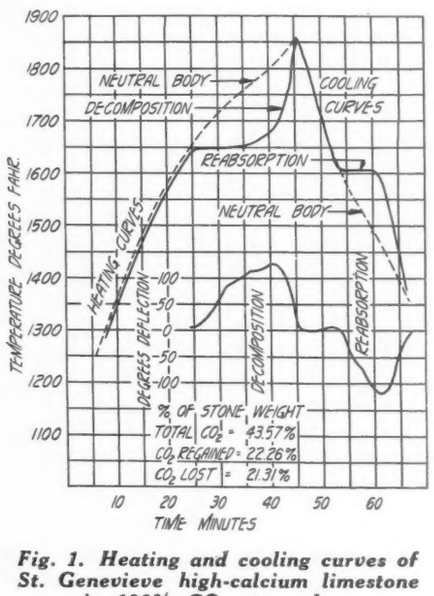


Fig. 1. Heating and cooling curves of St. Genevieve high-calcium limestone in 100% CO_2 atmosphere

may be, tar vapors, fine particles of smoke, sulphur dioxide, arsenic compounds, they to a greater or lesser degree will be absorbed or just deposited, contaminating the lime, often to such an extent as to prevent its use for special purposes.

After limestone is completely decomposed there will be breathing of another kind, temperature variation will raise or lower the amount of gas in the lime, causing a flow in and out, which again presents a chance of delivering impurities within the lime. If a piece of limestone, after it begins to decompose until finished, could be guarded against a drop in temperature, and after being finished be removed immediately into a zone where the atmosphere is such that contamination is not possible, then the inner portion would be as pure or purer than the original limestone.

All tests upon which this paper is based were made in the apparatus illustrated and described in the May 14, 1927, issue of Rock Products. This arrangement permits accurate measurement and control of temperature and also regulation of the atmosphere in which the limestone is decomposing. To help observation of changes in the active body, a neutral, non-reacting body of equal size located adjacently is heated simultaneously with the active body.

In Fig. 1, the heating and cooling curves are given of the St. Genevieve, Hunkins-Willis, high calcium limestone. The specimen in this particular test was maintained in a 100% CO_2 atmosphere. During the heating period decomposition started at 1650 deg. F., but of more interest is the cooling curve. The current to the furnace was shut off when the two bodies acquired a temperature of 1860 deg. F. When the furnace started to cool at first, both the lime and the neutral body cooled at equal rates. When, however, a temperature of 1605 deg. F. was reached, the lime stopped cooling while the neutral body continued. The

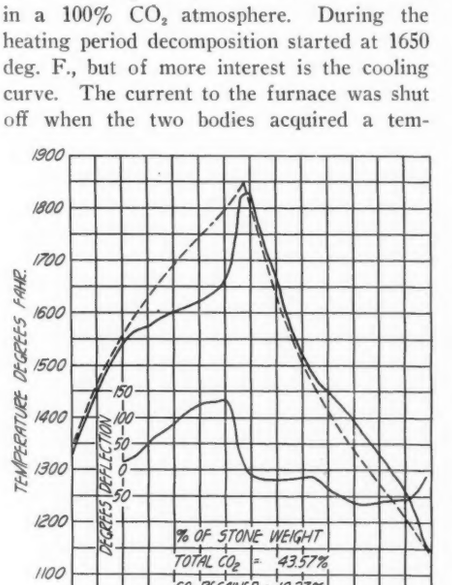


Fig. 2. St. Genevieve high-calcium limestone (solid) in rapid stream in 33% CO_2 atmosphere

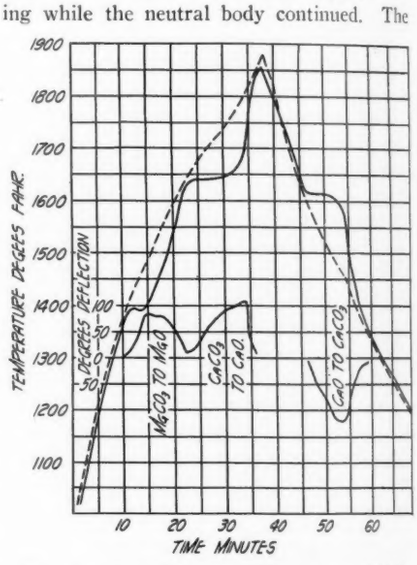


Fig. 3. Dolomitic limestone in 100% CO_2 atmosphere

lime cooling was retarded by the fact that it was absorbing CO_2 from the atmosphere, which is a heat-generating process, and the opposite of lime burning, which is a heat-absorbing process.

It will be noted that for a space of time re-absorption was very rapid and curves and calculations show that while 20 minutes were necessary to drive off the CO_2 from the stone, 51.1% of it was reabsorbed in 15 minutes after the proper temperature for re-absorption was reached. The re-absorption started 40 deg. F. below the temperature of decomposition. Evidently this 40 deg. represents the range of equilibrium; and that it should be as great is puzzling.

However, one may reason that the re-absorption of gas to this extent is possible only when the atmosphere is all CO_2; if there are other gases—nitrogen or oxygen that are not absorbed by the lime—they would accumulate within the pores of the lime, and so prevent further absorption of

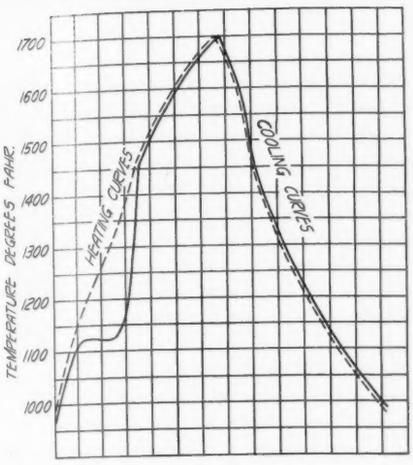


Fig. 4. Powdered California magnesite heated to 1700 deg. in 100% CO_2 atmosphere

CO_2 and thus stop this reverse process of limestone making. To prove this, a sample of limestone was burned in a rapid stream of air and CO_2 gas of which the CO_2 was only 33%. Fig. 2 shows the results; the CO_2 again was absorbed, but only 41.95% of what had been given off—a somewhat lesser quantity than in the former instance, but still quite a considerable amount.

During this test the decomposition as well as re-absorption periods were stretched out even though the heating and cooling rates were practically exactly the same as in the previous instance. This must be due to a slower rate of heating and consequently lower temperature differentials. The re-absorption continued to as low as 1175 deg. F.

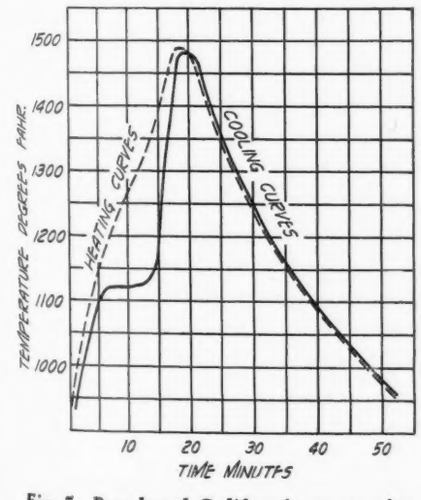


Fig. 5. Powdered California magnesite heated to 1480 deg. F. in 100% CO_2 atmosphere

while with a 100% CO_2 atmosphere it stopped at 1275 deg. F.

The next series of tests were with limestone of the same high calcium variety, but in an atmosphere of CO_2 and steam. While no outstandingly important results were obtained, the indication deducted from the shape of transformation curves is that the CO_2 absorption was inclined to be more energetic in the presence of the steam.

In Fig. 3 are presented the curves obtained with a dolomitic limestone. The decomposition takes place at two points, re-absorption, however, only at one. This, for several reasons, is of considerable practical importance; so a careful study was made of it. Evidently there is no re-absorption of CO_2 by the magnesium oxide, only the calcium oxide recarbonates, and that at a much greater rate than was the case with high calcium limestone. While no MgO was reconverted to the carbonate, 86.4% of the CaO was changed back to $CaCO_3$, a very high figure, when compared with those previously obtained. Why this is so is a different story entirely which takes us into the study of arrangement of the ultimate structure of lime and limestone, which the writer explained to some degree in his paper before the American Chemical Society at the Richmond convention in April (Rock Products, June 11, 1927).

But why was the magnesium oxide not recarbonated? Frequent tests with dolomitic stone showed no retardation in cooling effect. To further check, a sample of California magnesite was heated and cooled and

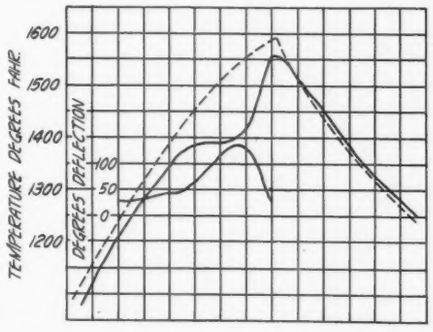


Fig. 6. Magnesium limestone heated to 1550 deg. F. in 33% CO_2 atmosphere

Fig. 4 shows a perfectly smooth cooling curve. Then, an opinion was formed that probably the sample is overburned, its porosity destroyed, so a sample of magnesite was again subjected to test, but this time it was heated to 1480 deg. only, but still on cooling there was no re-absorption as shown in Fig. 5.

If CaO readily absorbs CO_2 but MgO does not, why should it not be possible to decompose limestone under modified temperatures so that all $MgCO_3$ is decomposed and only little $CaCO_3$? And such CaO that may have been formed may be again carbonated and leave a mixture of practically pure MgO and $CaCO_3$.

A specimen of dolomitic limestone was subjected to this partial decomposition in an atmosphere such as would exist in a kiln, and the results are given in Fig. 6. While all the $MgCO_3$ was broken up, there was only 0.3% of CO_2 from $CaCO_3$ that was not re-absorbed.

That such partial decomposition is entirely practical on a large scale in a vertical kiln was later the writer's experience, and so a process may be worked out for manufacturing magnesium oxide that may be quite simple and profitable.

Fig. 7 shows the passing of calcium hydrate back into oxide and again into hydrate forms. The oxide reformed from hydrate is what is called "activated," being more intensively active than ordinary oxide.

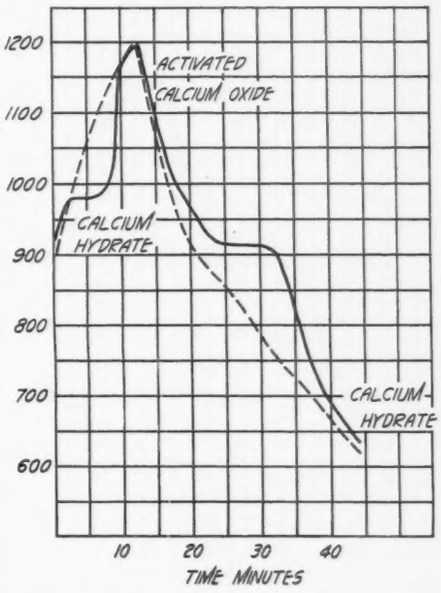


Fig. 7. Hydrated lime in 100% steam atmosphere

The readiness with which it again takes on water is plainly shown. While manufacture of activated oxide is entirely practical, great care must be taken in the process to prevent access of water vapor existing in the atmosphere.

Interesting results were obtained in heating hydrate in an atmosphere of CO_2 (Fig. 8). There was little deflection in the heating curve at the point where water is driven off from the hydrate, the reason evidently being that as the oxide formed it immediately absorbed CO_2, and so was converted to carbonate. The two reactions are

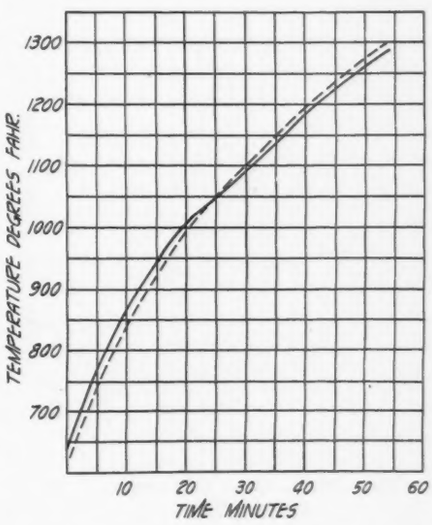


Fig. 8. Hydrated lime in 100% CO_2 atmosphere

almost simultaneous; and since one is endothermic and the other exothermic they tend to neutralize each other sufficiently and do not show up prominently. The two lines cross at 1140 deg. F., this being due to the difference in weight. Somewhere below this point the specimen is hydrate of lower specific gravity, lower heat capacity and thus has a quicker heating rate, while above it is carbonate, denser, weighing more and requiring more heat to raise its temperature.

All of these tests were made on small solid specimens. In the case of large lumps temperatures will not vary as rapidly; gas flow inwards, due to greater distances to penetrate, will be slower, but even then proof that there is a flow is easily noted by the dark veins leading into the lime made in smoking kilns and by the rings, often noted, when large lumps are broken open. These rings mean that in the travel through the kiln at one or another time recarbonization took place. Many very peculiar things can happen to a lump of lime when passing through different temperature zones and when subjected to atmospheres of different compositions. Many chemical reactions come into play, also many physical changes take place, all caused mainly by temperature and temperature variations.

The Hungarian Bauxite Industry

BAUXITE deposits are located in two districts in Hungary—the northern in the Vertes mountains, which extend northeast from the southwestern hills of the Vertes almost to the Danube river, and the southern in the Bakony mountains on the northwest coast of Lake Balaton. It is estimated that the bauxite deposits in these fields amount to 200,000,000 metric tons.

Exploitation in Northern District

Exploitation has recently begun in the Vertes mountains in the vicinity of the village of Gant in the county of Fejer. In this district 1200 to 1400 tons of ore are produced per day by the use of surface-mining methods. Production for 1927 is estimated at 250,000 to 300,000 tons. The bulk of the ore produced is at present exported to Germany, although a small percentage is utilized in Hungary for experimental purposes. Germany formerly received its bauxite from Istria, but since the establishment of an aluminum factory near Venice these shipments have been discontinued, and the German aluminum interests now depend almost entirely on the Hungarian bauxite. The rapid development of the industry in Hungary dates from the cessation of the Italian shipments to Germany.

Exports to Germany—Prices

Hungarian bauxite exports amounted to only 120 quintals in 1925 and to 721 quintals in 1926. Important exportation began in the present year with the first shipments to the Lautawerke Co., a German firm. According to the Royal Hungarian Bureau of Statistics, 15 metric tons of bauxite ore were exported to Czechoslovakia and 24,007 tons to Germany during the first quarter of 1927.

The domestic and export prices of bauxite are fixed according to the quality of the ore and range from 12 to 20 English shillings per ton f.o.b. freight cars at Bodajk station, county of Feher.

Two Companies Operating

There are two corporations engaged in bauxite mining—the Aluminum Ore Mining and Industrial Co. and the Tapolca Mining Co., both of Budapest. The former was established in 1917 to exploit bauxite deposits in Rumania and in 1923 was merged with Rumanian and Italian companies and formed into the Bauxite Trust A. G., with a capitalization of 3,000,000 Swiss francs. The shareholders of the Hungarian corporation obtained the right to exchange their securities for the shares of the newly organized company, which are quoted on all important European exchanges. This company operates the mines at Gant and is in close relation with three industrial companies. The Tapolca company is also controlled by the Aluminum Ore Mining and Industrial Co. and by the Bauxite Trust A. G. Its bauxite fields, however, are not yet under exploitation.

Utilization of Domestic Ores Planned for Cement Manufacture

Although at present the bauxite ore mined in Hungary is exported almost entirely to Germany, where it is used by Lautawerke in the manufacture of aluminum, the erection of an alumina and aluminum factory at Csepel (Budapest) for the utilization of domestic ores is planned. In addition, experiments are being made to discover new methods for the production of bauxite cement. These experiments have progressed to date so far that each of the participating coal companies has begun the construction of cement factories and has contracted with the Aluminum Ore Mining and Industrial Co. for supplies of ore. These new cement factories are expected to start manufacturing in 1928, and it is estimated that the first year's combined production will amount to 100,000 tons. The bauxite-ore requirement is estimated at 60,000 to 70,000 tons. Production is expected to increase gradually, and it is hoped to develop an export trade either through direct exportation of cement or through the erection of foreign branch factories supplied with Hungarian ores.

No decision has been reached as yet in regard to a definite manufacturing process for the projected Hungarian aluminum factory. The Lautawerke Co. of Germany employs the thermoelectric process and the final results at that factory will decide the kind of machinery and other equipment to be used for the Hungarian aluminum works.

New Process Sought for Making Cheap High Alumina Cement

The bauxite-cement manufacturing process as patented in 1908 was not found very practical, since the high cost of the necessary energy made the product more expensive than portland cement. The associated Hungarian bauxite interests have authorized experimentation in search of a new process for the utilization of the recently discovered bauxite ores of the country, the experiments being financed partly by government subsidy and partly by the bauxite interests. The bulk of the Hungarian ore is not of the best for the manufacture of aluminum alone. The present process utilizes only such ores as contain a small percentage of silicon and titanium oxides, in order that the cost of production of suitable aluminum oxide may be lowered by utilizing the byproducts for cement making and extracting the iron.

Experiments with a proposed new process conducted on a large scale in provisional plants especially built for these tests have met with such success that the bauxite cement produced is claimed to be superior to portland cement as well as to "ciment fondu" as produced in the United States and in France.—Vice Consul John H. Morgan, Budapest, in *U. S. Commerce Reports.*

Phosphate Developments in Morocco

THE exploitation forces at Bou-Jniba during 1927 are to be doubled in number, and the narrow gage railway connecting this place and Kourigha is to be replaced by a normal gage line. At Kourigha a third set of drying apparatus is in course of construction and will be placed in operation at the end of 1928. It has been thought that this apparatus might be dispensed with and drying in the sun only would be sufficient, but a careful study during the past two years has shown that solar heat, as in Algeria and Tunisia, is not enough during four or five months of the year to reduce the content of moisture to the required 7% or 8%. A third screening apparatus is also being constructed. The storage accumulators, the additions to which will be finished in August, 1927, will contain 110,000 metric tons, to which will be added 65,000 tons of stock carried in the original storage bins. These stocks are sufficient to assure regularity of shipments in the future.

The putting into operation of the new phosphate loading installation on the transverse jetty in the port of Casablanca was set for December 15, 1926, but on account of damages sustained in November to the railway lines leading to it on the jetty this was postponed until January 15, 1927. In addition to the storage capacity of 75,000 tons, the new installation will be able to handle from 1,700,000 to 1,800,000 metric tons per annum.—Consul H. Earle Russell, Casablanca, in *U. S. Foreign Commerce Reports.*

Plant and limestone quarry of Penn-Dixie No. 2. The fuller's earth quarry connects with the right-hand end of this quarry

Cement Made from Limestone, Fuller's Earth and Kaolin

Penn-Dixie No. 2 Plant at Clinchfield, Ga.

PLANT No. 2 of the Penn-Dixie Portland Cement Co. was built by the Clinchfield Portland Cement Co. of Kingsport, Tenn., before it entered into the Penn-Dixie consolidation. It was described shortly after it was completed, in ROCK PRODUCTS for September 19, 1925. At that time it was producing about 2000 bbl. daily. The demand for its product grew so the plant had to be enlarged in every department to meet it, and at present it is producing 3000 to 3500 bbl. daily. The addition of another kiln would bring the output to 4500 bbl., since all the other departments have been increased to maintain such a capacity.

What makes the story interesting is that a manufacturing method had to be perfected at the same time the increased production was being provided for and then maintained. The plant is at Clinchfield, Ga., about 30 miles from Macon. It is in the coastal plain area of the state, where there are none of the hard limestones used for burning to lime in the northern part of the state. The lime rock used is the Ocala limestone so much employed in building the "self-cemented" roads of Florida. It is so soft that a piece 2 in. thick can be broken with the fingers. At the same time it contains hard pieces, one streak in the Clinchfield quarry, about 2 ft. thick, being as hard as any blue limestone. It was for this reason gyratory crushers were thought necessary to handle a material the greater part of which is so easy to crush to mill feed size.

General view of the plant at Clinchfield, Ga.

Unusual Cement Raw Materials

The other cement materials used are equally unusual, for they are fuller's earth and kaolin. Fuller's earth is harder than ordinary clay but not so hard as the lime rock described above. It is usually crushed at the plants at which it is prepared for sale (as fuller's earth) by differential rolls. But these seemed hardly adapted to preparing it for making cement. Until recently it has been crushed by the same gyratory crushers that crushed the limestone.

As to the kaolin, that offered no difficulty, for it goes into suspension in a wash mill of the type ordinarily used for clays in cement mills.

The first problem, then, was to find the best crushing method for such materials, and crushing the limestone and fuller's earth separately and together was tried. Best results were obtained by separate crushing, so that finally the crushing plant was run for five days on lime rock and one day on fuller's earth. Meanwhile experiments were made with other forms of crushers than the gyratory and a crusher was found that crushed either fuller's earth or a mixture of fuller's earth and limerock quite satisfactorily. This is the Dixie hammer mill, a crusher designed especially for handling soft and sticky materials. Its feature is a device for cleaning the breaker plate, run by a separate motor, so there is no accumulation of sticky material building up on any part. With this mill the fuller's earth may be mixed with the lime rock or crushed separately, as desired. The mill had just been changed from a temporary installation for testing to a permanent installation, and it was intended to crush both the fuller's earth and lime rock in it and shut down the gyratories when this was written.

Three-Component Mix Used

The use of a three component mix is not usual in American cement plants, and the nature of the three materials used at Clinchfield is so out of the ordinary that the analysis and a word as to the method of mixing would seem to be in order. An average analysis of the lime rock is:

$CaCO_3$	87%
SiO_2	9%
R_2O_3	4%
	100%

The Ocala limestone of itself runs 97% to 98% $CaCO_3$, but it is quarried without stripping, and the analysis given is of the rock as quarried. The strippings are partly black soil which has been found to have

Rock storage and piles of kaolin, fuller's earth and lime rock

a beneficial effect in decreasing the required moisture content of the slurry.

A typical sample of fuller's earth analyzed:

SiO_2	69.00%
Al_2O_3	16.20%
Fe_2O_3	4.10%
CaO	1.62%
MgO	1.34%
Loss on ignition	7.07%
	99.33%

A typical analysis of the kaolin is:

SiO_2	50.42%
Al_2O_3	36.69%
Fe_2O_3	1.13%
CaO	0.72%
MgO	0.21%
Loss on ignition	10.99%
	100.16%

Mixing Methods

The materials as produced are fairly uniform in analysis, which renders the problem of mixing a comparatively simple one. The method adopted is to feed the raw grind mills a certain definite amount of kaolin from the wash mill, which, of course, means a definite amount of water as well. The lime rock and fuller's earth are taken to the feeders of the raw grind mill from storage piles, and the crane man is instructed to take so many buckets of lime rock to one of fuller's earth. Of course the mixing is carefully checked by analyzing control samples, but it has not been found necessary to use any complex methods of calculating or to introduce many refinements. The success of the method is proven by the remarkably uniform analysis of the clinker over long periods. For the three months preceding the time the plant was visited, the clinker analyzed: 66.81%, 66.72% and 66.89% in CaO.

The quarry was thoroughly core-drilled and mapped before operations were started, and the keeping of a uniform analysis is partly due to selecting the portions of the face at which the work is carried on.

Moisture was another problem presented by the unusual nature of the materials, for where waste heat boilers are employed it is necessary to keep the moisture content of the slurry as low as possible. Every pound of water to be dried out of the slurry requires about one-seventh of a pound of coal to evaporate it, and on a large tonnage a single per cent of added moisture has its effect on the coal pile. Clayey materials vary widely in regard to the water they will take up before flowing like a liquid, and fuller's earth requires a lot of water to make it mobile. The principal change required in the plant to run the lowest possible moisture was that of substituting Wilfley centrifugal pumps for the belt and bucket elevators originally installed for handling the slurry from the raw grind mills to the slurry tanks, and from the slurry tanks to the kiln feed. This change has permitted the lowering of the moisture content 7%. The present moisture content of the slurry is 38% and every care is taken to see that it does not get any higher. Below this the slurry has a custard-like consistency.

Quarrying

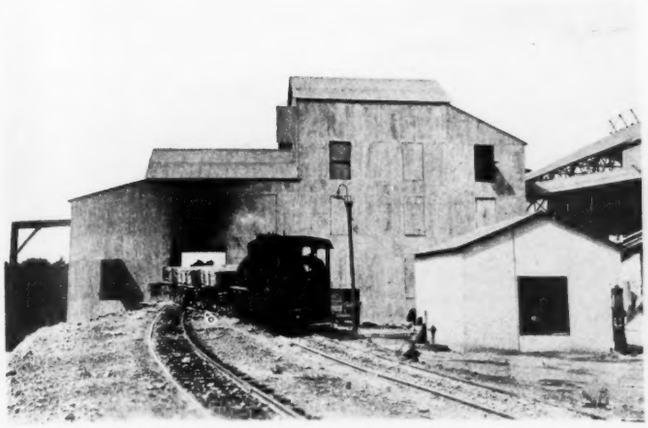
The lime rock quarry is near the plant and the fuller's earth quarry just beyond. A connection was being made when the plant was visited, and the combined quarry face is now about half a mile long and has an average height of 40 ft. In quarrying this same lime rock in Florida it was found necessary to devise a special tubular bit for drilling, but here the bits of ordinary shape are found to do good work. Holes are put down with a Sanderson-Cyclone drill 30 ft. apart and carrying 45-ft. burden. They are sprung with ordinary dynamite and then a charge of 20% dynamite is placed in the bottom and the remainder of the hole is loaded with black powder, except for the tamping, which has to be fairly heavy to make the hole break well. The rock tends to blow out in large pieces in certain parts of the face, and these have to be block-holed with Ingersoll-Rand jackhamers.

The fuller's earth is quarried in about the

Drilling in the lime rock quarry

Quarry face, 40 ft. in height and new shovel loading lime rock

Face of the fuller's earth quarry; about 40 ft. high at this point



Quarry train at the rock crushing plant

Quarry train loaded with lime rock

same way as the lime rock and is loaded into cars by an Osgood shovel with a ¾-yd. dipper.

The broken rock is loaded into 5-yd. Western side-dump cars by two Marion No. 37 steam shovels, one of which had been acquired just before the plant was visited. Narrow gage Vulcan steam dinkeys are used to bring the rock in to the crushing plant, the track running up a slight incline so that the cars may be dumped directly into the crusher. At the time the plant was visited the primary crusher was a 15-in. Allis-Chalmers gyratory followed by a No. 10 McCully reduction crusher which crushed the oversize of a screen with 3-in. holes. But the present practice is to send everything to the Dixie hammer mill described above.

Newly installed hammer mill for crushing fuller's earth with limestone

The Dixie hammer mill is driven by a 250-hp. motor, and a 5-hp. motor runs the cleaner for the breaker plate. The horsepower is the same that was used for the gyratory plant, a 125-hp. motor being used on the primary crusher, a 100-hp. motor on the reduction crusher, and a 30-hp. motor on the pan conveyor.

From the primary crusher the material goes to the raw storage by a belt conveyor, to be distributed by a crane. The storage shed is 240 ft. long and 75 ft. wide and it is crossed by a 7½-ton Harnischfeger crane. It is divided into three unequal parts, a space that will hold 18,000 tons of limestone, another that will hold 5700 tons of fuller's earth, and a third that will hold 3900 tons of kaolin. The crane not only distributes the materials as they are received, but takes them to the feed hoppers of the raw grind, except the kaolin, which it takes to the wash mill. Sixty feet of this raw storage shed has been added since the plant was built.

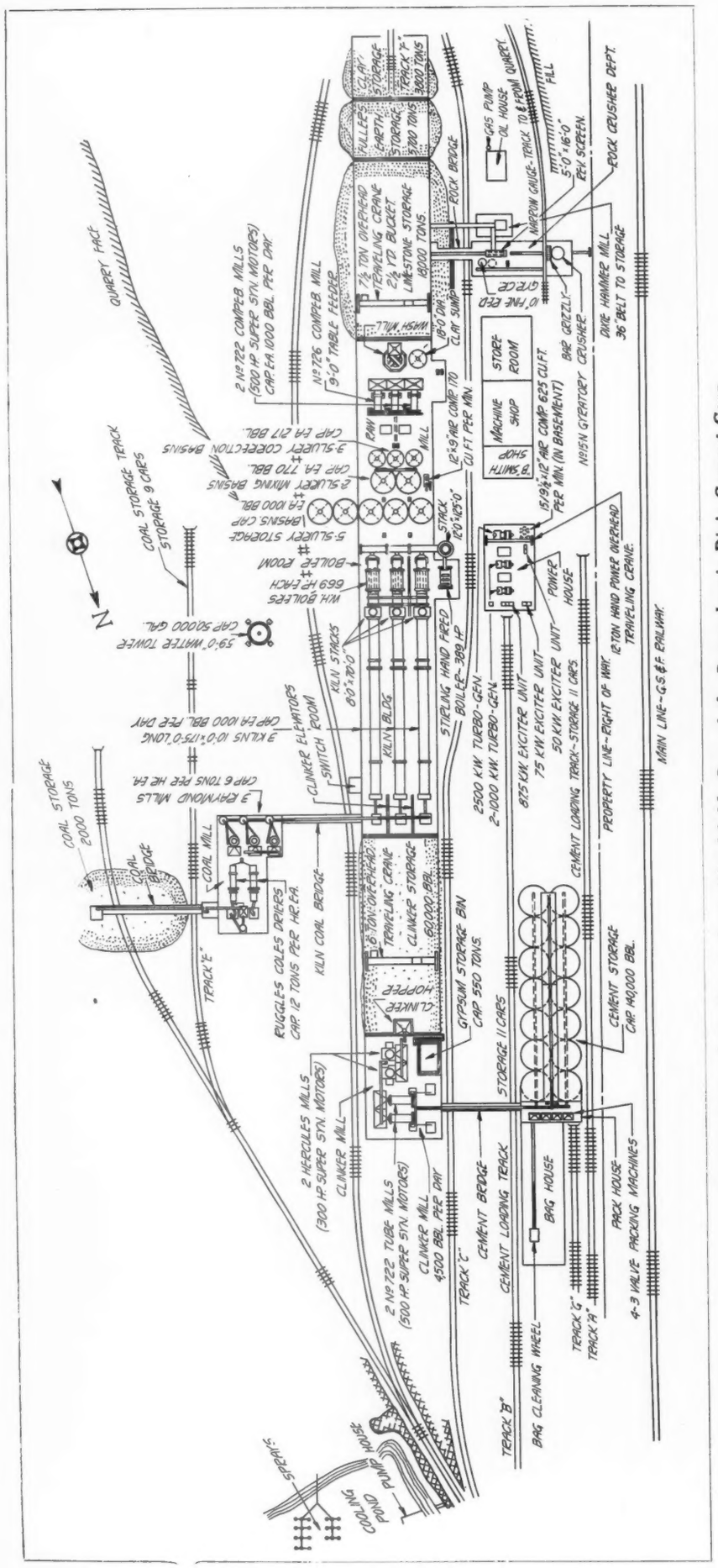
The wash mill was made by Allis-Chalmers and it is 16 ft. in diameter and driven by a 20-hp. General Electric motor. The discharge of the mill flows by gravity to a concrete storage tank, from which it is pumped to the raw grind mills.

The original raw grind installation consisted of two 7x22-ft. Allis-Chalmers compeb mills with a mill of another type which has since been removed. Quite recently a 7x26-ft. compeb mill of the same make as the others has been installed. The original mills are driven by General Electric super-synchronous motors without clutches. The new mill is driven by an Allis-Chalmers synchronous motor and has a Cutler-Hammer magnetic clutch between the motor and the mill.

The soft and somewhat sticky nature of the materials made it difficult to admit them to the mill through feeders of the ordinary type. After some experimenting the engineers of the Allis-Chalmers company designed a new type of table feeder, one of which was installed some months ago. It has been so satisfactory in its work that the other mills will eventually be equipped with it. The feeder has a conical hopper 9 ft. in diameter into which the material is placed by the crane. Below this hopper is a neck about 3 ft. in diameter, and below this, but separated by a space of 4 or 5 in., is a revolving plate or table, about 8 ft. in diameter. The table revolves very slowly, forcing the material that issues between it and the neck against an inclined scraper which scrapes it into the mill. The feed is constant and very regular and there is no chance of the material clogging the space through which it flows onto the table or of sticking to any part. The revolving table is the only moving part and it is driven by a 20-hp. direct-current motor through a Foote Bros. speed reducer.

The discharge of the raw grind mills is pumped to any one of three concrete cor-

Shovel working at the connection between the two quarries


QUARRY FACE
2 No 722 COMPEB MILLS (500 HP SUPER SYN. MOTORS) CAP EA 1000 BBL. PER DAY
No 726 COMPEB MILL 9'-0" TABLE FEEDER
7½ TON OVERHEAD TRAVELING CRANE 2¼ YD BUCKET LIMESTONE STORAGE 18000 TONS.
COAL STORAGE TRACK 9 CARS 1800 TONS
PULLEY'S EARTH STORAGE 5200 TONS
ROCK BRIDGE
GAS PUMP OIL HOUSE
NARROW GAUGE-TRACK TO & FROM QUARRY
FILL
5'-0" x 16'-0" REV. SCREEN.
ROCK CRUSHER DEPT.
GYRATORY
FINE FEED
BAR GRIZZLY
NIVEN GYRATORY CRUSHER
DIXIE HAMMER MILL
36" BELT TO STORAGE
WASH MILL
60' DIA. CLAY SUMP
STORE ROOM
MACHINE SHOP
BLACKSMITH SHOP
FAN
No 9 AIR COMP 170 CU FT PER MIN
12'-9" x 12" AIR COMP 625 CU FT. PER MIN. (IN BASEMENT)
3 SLURRY CORRECTION BASINS CAP EA 217 BBL.
2 SLURRY MIXING BASINS CAP EA 770 BBL.
5 SLURRY STORAGE BASINS CAP EA 1000 BBL.
STACK 120'x5'-0"
COAL STORAGE TRACK STORAGE 9 CARS
BOILER ROOM
WH BOILERS 669 HP EACH
59'-0" WATER TOWER CAP 50000 GAL.
STIRLING HAND FIRED BOILER-309 HP
2500 KW TURBO-GEN.
2-1000 KW TURBO-GEN.
875 KW EXCITER UNIT
75 KW EXCITER UNIT
50 KW EXCITER UNIT
POWER HOUSE
12 TON HAND POWER OVERHEAD TRAVELING CRANE.
PROPERTY LINE-RIGHT OF WAY.
MAIN LINE-G.S. & F. RAILWAY
3 KILNS 10'-0"x175'-0" LONG CAP EA 1000 BBL. PER DAY
CLINKER ELEVATORS
SWITCH ROOM
KILN STACKS 6'-0"x 104'-0"
KILN BLDG.
CAP 6 TONS PER HR EA.
3 RAYMOND MILLS
COAL STORAGE 2000 TONS
COAL BRIDGE
COAL MILL
RUGGLES COLS DRYERS CAP 12 TONS PER HR EA.
KILN COAL BRIDGE
TRACK "E"
6 TON OVERHEAD TRAVELING CRANE
CLINKER STORAGE 60000 BBL.
HOPPER
CLINKER
GYPSUM STORAGE BIN CAP 550 TONS.
STORAGE 11 CARS
CEMENT LOADING TRACK-STORAGE 11 CARS
CEMENT STORAGE CAP. 140,000 BBL.
2 HERCULES MILLS (300 HP. SUPER SYN. MOTORS)
CLINKER MILL
2 No 722 TUBE MILLS (500 HP SUPER SYN. MOTORS)
CLINKER MILL 4500 BBL. PER DAY
TRACK "C"
CEMENT BRIDGE
CEMENT LOADING TRACK
BAG HOUSE
PACK HOUSE
4-3 VALVE PACKING MACHINES
TRACK "G"
TRACK "A"
TRACK "B"
BAG CLEANING WHEEL
SPRAYS
PUMP HOUSE
COOLING POND
N

Ground plan of the No. 2 plant, Clinchfield, Ga., of the Pennsylvania-Dixie Cement Corp.

rection tanks by two 4-in. Wilfley centrifugal pumps. One pump takes the discharge of the two 7x22-ft. mills and the other that of the 7x26-ft. mill. The three correction tanks are 18 ft. in diameter and 10 ft. deep. A system of pipes and valves in the bottom of each allows the contents to flow to either of two mixing basins which are 24 ft. in diameter and 16 ft. deep. The slurry is corrected by drawing the proper proportions from the correction tanks and then agitating in the mixing basins as long as the time available will permit. The corrected slurry is then pumped to either of five storage tanks, which are 24 ft. in diameter and 24 ft. deep, by a 6-in. Wilfley pump. Two of these storage tanks are provided with Dorr agitators; the others, and the correction tanks and mixing basins, are provided with Smidth agitators. Each of the storage tanks holds the material for 1000 bbl. of cement.

The feed to the kilns is by "Ferris-wheel" feeders which are supplied by a 4-in. Wilfley pump, the excess returning to the pump sump. Originally a gravity feed was tried, but the Ferris-wheel feeders were found to give more uniform feed and to be easier to adjust.

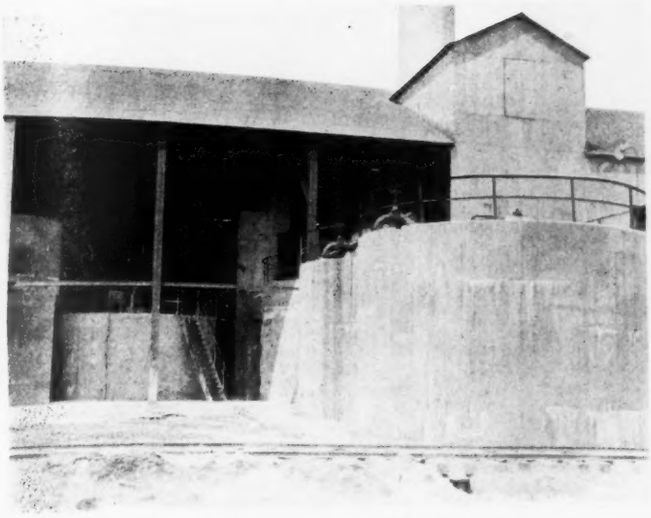
The kilns, which are 10 ft. in diameter and 175 ft. long, were made by Allis-Chalmers. They are driven by 75-hp. variable speed General Electric motors through Link-Belt silent chains and enclosed gears. The fuel used is powdered coal which is fed by Allis-Chalmers double screw feeders. The coal grinding plant is at one side of the kiln house and it contains two Ruggles-Coles coal dryers and three Raymond mills with the usual air separating system. The powdered coal is conveyed directly to the mills by a screw in a covered gallery. Each mill is driven by a 60-hp. General Electric motor.

Coal is stored in a pile at one side of the grinding plant. It is recovered by a Browning locomotive crane which feeds it to the hopper of a belt on a bridge which passes into the coal grinding plant and discharges into the hopper of the coal dryers. Kentucky coal is used, which has a low ash and carries about 13,500 B.t.u.'s per pound.

The materials used at this plant appear to make a mixture which is somewhat easier to burn than that from some other cement materials. As much as 1150 bbl. per day per kiln has been produced, and this is rather more than would be expected from a kiln of this size, perhaps as much as 10% more.

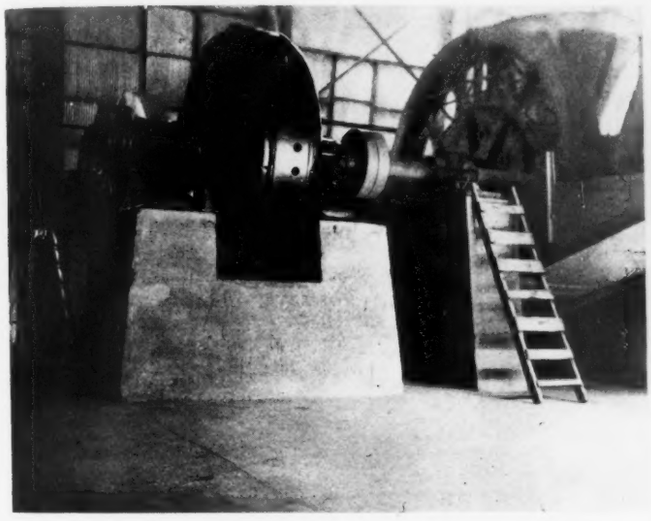
No Coolers Used

A peculiarity of this plant is that there are no coolers. Each kiln discharges into the boot of an elevator which lifts the clinker high enough so that it will fall into the clinker storage. At the point where the elevator discharges sprays of water wet the clinker and cool it rapidly. This method of cooling is thought to give a better and more uniform quality of cement than air cooling.

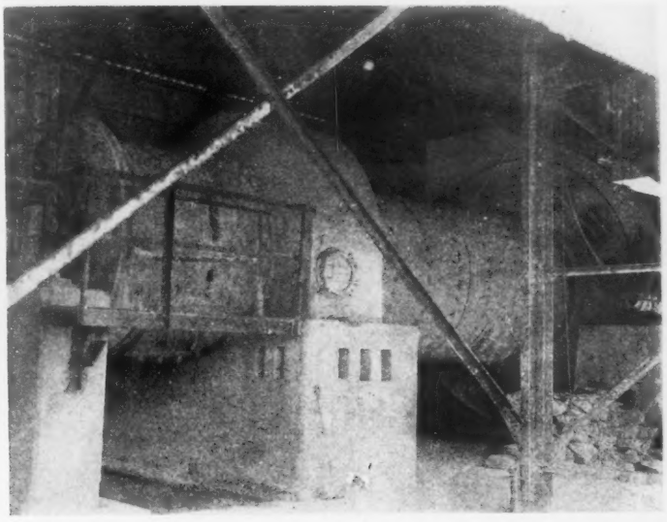


Slurry tanks of reinforced concrete with closed tops. Storage basins in foreground

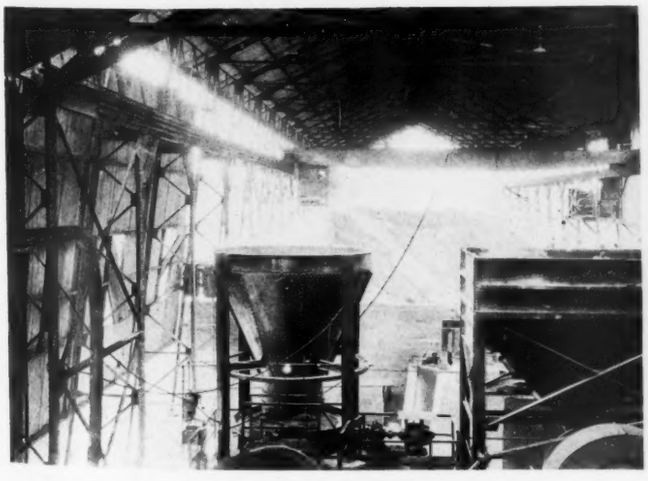
Correction tanks, piping to mixing tanks and agitating gear and drives on mixing tanks



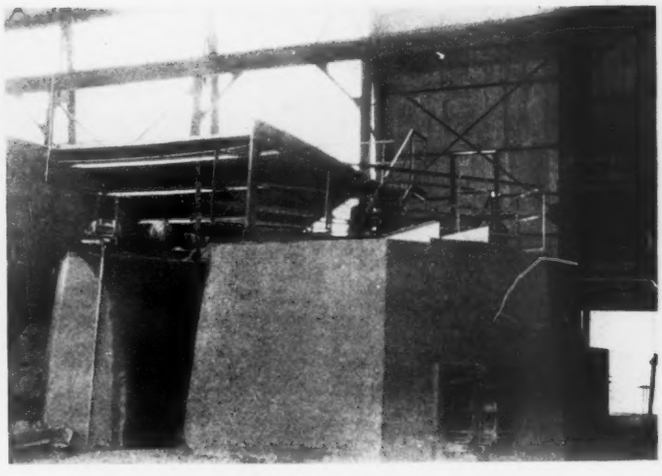
Synchronous motor and clutch driving the new raw grind mill



New 7x26-ft. compeb mill which has been installed in raw grind department

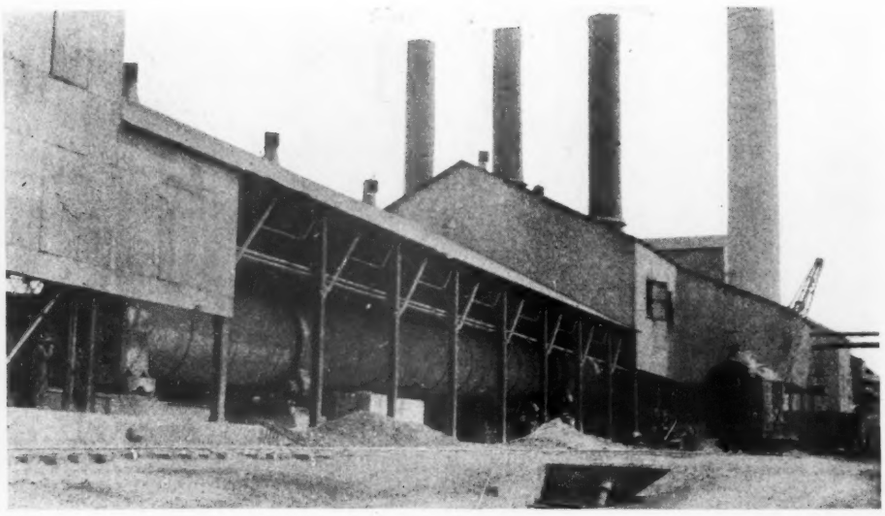


New type of table feeder used in raw grind mill for handling sticky materials



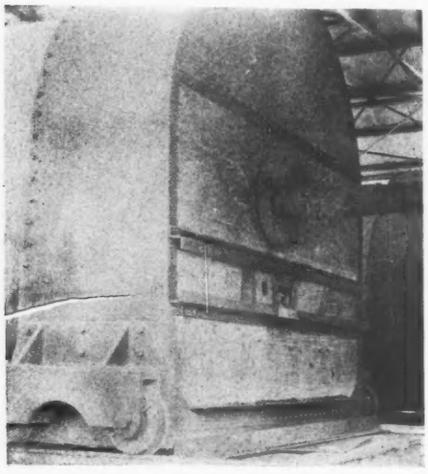
The 16-ft. wash mill used to prepare the kaolin added to the fuller's earth and limestone

Details of Penn-Dixie No. 2 Plant at Clinchfield, Near Macon, Ga.



Kiln department. The three stacks are standbys, the gases ordinarily going to the waste-heat boilers and the concrete stack

The clinker storage is the same size as the rock storage, 240x75 ft., and it is one of the additions made since the plant was originally installed. It is employed not only for storing but also for bedding the clinker. The crane builds up a pile at one end while it takes from a pile already built at the other. As it always takes from the bottom of the pile, each bucketful is a sample of everything in the face above it. The 6-ton electric crane was furnished by the Shepard Electric Crane and Manufacturing Co.



One of the kiln hoods

The finish grind mill was installed with machinery which had sufficient capacity to care for future needs, and no additions have been made to it. It contains two Bradley Hercules mills, each driven by a 300-hp. General Electric supersynchronous motor, and two 7x22-ft. tube mills which grind the product of the Hercules mills. These were made by the Bethlehem Foundry and Machine Co., and each is driven by a 300-hp. supersynchronous motor, of General Electric make, direct.

Improvements in Packing and Storage Departments

A number of improvements were being made in the packing and storing department when the plant was visited. A Sly dust collector had just been put in place over the four Bates valve bag packers, and this was being connected with the packers and the bag cleaner. The bag cleaner is of the cylindrical type and it was designed and built at the plant. The dust from it is taken by a screw conveyor and passed over a screen of the gravity type and then elevated to the packer bins.

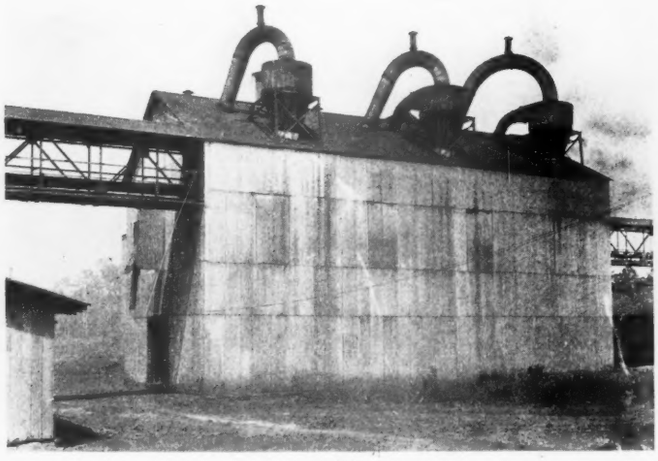
Eight silos were built shortly after the plant was completed, and about seven months ago six more were built. Altogether they have a capacity of 140,000 bbl. The more recently built silos were put up by the Spencer Construction Co. in eleven days.

Dust collector recently installed on roof of packhouse

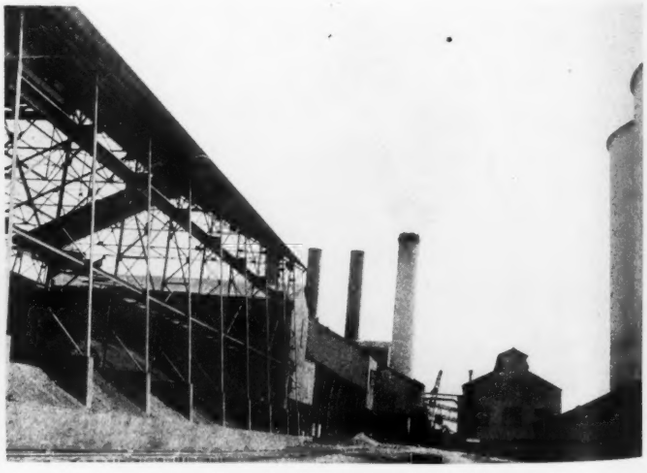
The method used for getting the cement to and from the silos is the classic combination of screw conveyors and elevators. A feature of the recovery of the cement from the silos is the use of a special cement valve, made by the Bethlehem Foundry and Machine Co., which does not clog. All the screw conveyors are 16 in. in diameter.

Power Plant

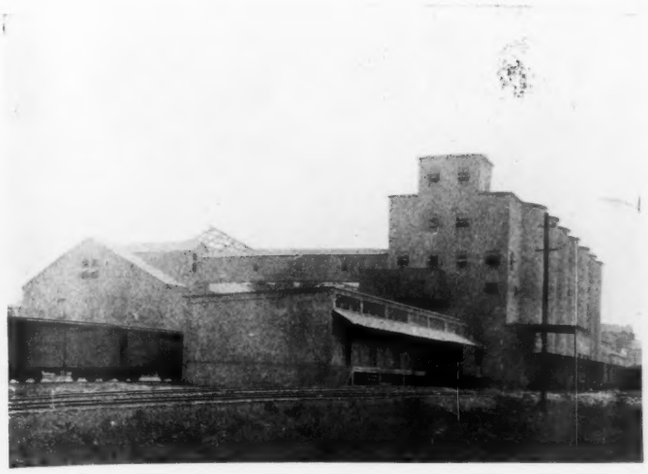
The power plant, installed since the plant was built, is one of the most interesting fea-



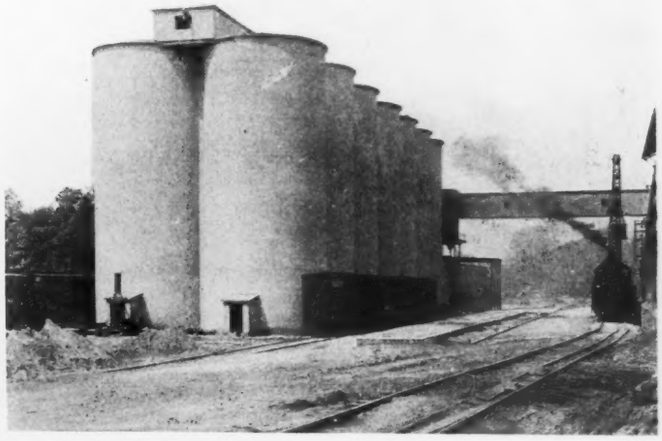
Coal grinding plant with air separators above the roof



Clinker storage adjoining the kiln house



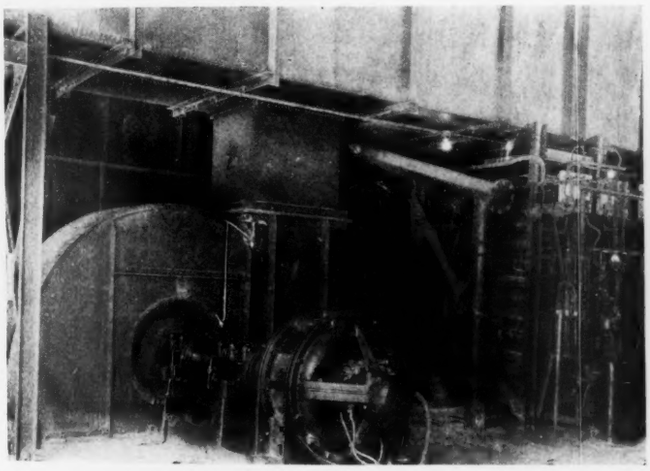
Packhouse and conveyor connecting packhouse with the finish grind mill



The 14 storage silos with combined storage capacity of 140,000 bbl.

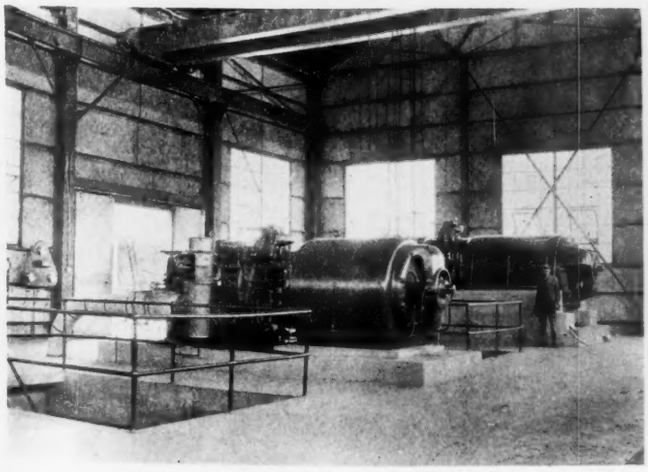
tures of this operation and its usefulness may be judged when one considers the distance that coal has to be brought to the plant. The waste gases from the kilns are drawn through three Babcock & Wilcox water tube boilers, and then through a Green fuel economizer and sent to the stack. The steam generated goes to the power house, set parallel with the kiln house. A Stirling boiler, hand fired, is placed between the two and kept as a standby in case of repairs to one of the waste heat boilers. The three fans which pull the gases through the economizer are of Green make and each is driven by a 100-hp. General Electric motor.

The power house contains three turbo-generators, all of General Electric make. The largest has an output of 2500 kw. and can carry the whole load. The capacity of the two remaining is about equal to this and they are held as a reserve. The large gen-

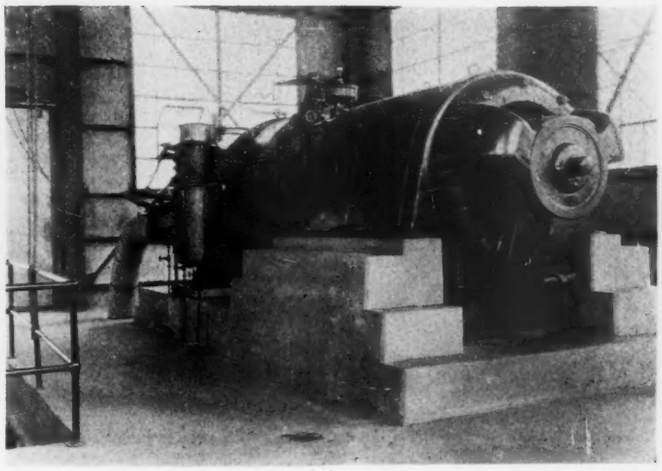


Fan set and fuel economizer for waste-heat boilers

Power plant housing the turbo-generators

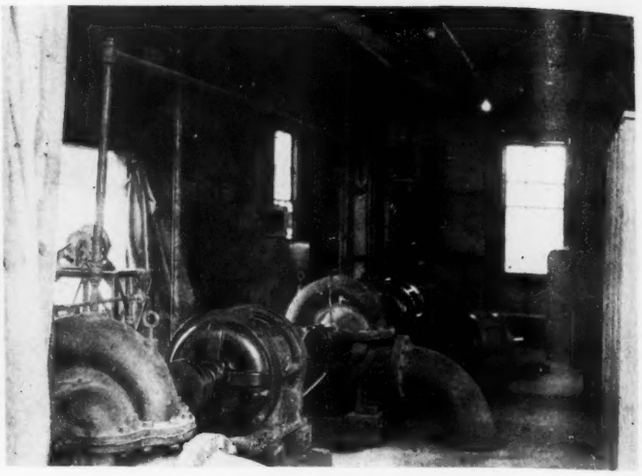


Interior of power plant showing two of the three turbo-generators



Turbo-generator, 2500 kw., which is a recent addition to the power plant

Spray coolers and pond for condensing water



Pump and motors in pumping station

erator is one of the additions made some time after the power plant was built. There are also three exciters in the power house, one of 50 kw., one of 75 kw., and one of 87.5 kw. In the basement of the power house is a 625-ft. Ingersoll-Rand air compressor.

Water for the condensers that take the exhaust of the turbo-generators is brought from a pond 962 ft. away. The lines which bring in the water, and return it with the condensate, are of 30-in. concrete pipe made in place by the Lockjoint Concrete Pipe Co. At the pond there is a set of cooling sprays made by the American Spray Co. About 250,000 gallons of water per day is required for condensation and this is furnished by three Worthington pumps each direct connected to a 60-hp. General Electric motor.

The plant is in charge of Conrad C. Miller, a son of John A. Miller, the president of the Penn-Dixie Co. Mr. Miller has been in charge ever since the plant was built and has installed the additions and improvements mentioned in the above description. The plant is known as No. 2 Plant of the Penn-Dixie Co.; the others are at Kingsport, Tenn., Richard City, Ala., Portland Point (on Cayuga Lake), N. Y., and at Bath and Nazareth, Penn. George Killian is the secretary of the company.

Double concrete pipe line, 962 ft. long

All the preliminary work, which meant so much in the case of a plant using raw materials of an unusual nature, was worked out by E. P. Newhard, now chief chemist of the Penn-Dixie Co. The power plant was designed by R. S. Scott of Philadelphia.

Besides Mr. Miller, the operating management includes C. S. Vance, assistant superintendent; N. V. Geyer, chemist; A. A. Holm, engineer; J. A. Grubb, chief clerk.

A list of additions made includes:

A Marion No. 37 steam shovel.

Dixie hammer mill crusher and motors.

A 60-ft. addition to the raw storage shed.

A 7 x 26-ft. Allis-Chalmers compeb mill with motor of the same make.

Special table feeder for new compeb mill.

New Allis-Chalmers kiln, 175 ft. long and 10 ft. in diameter.

Two 6-in. and three 4-in. Wilfley slurry pumps in place of bucket and belt elevators.

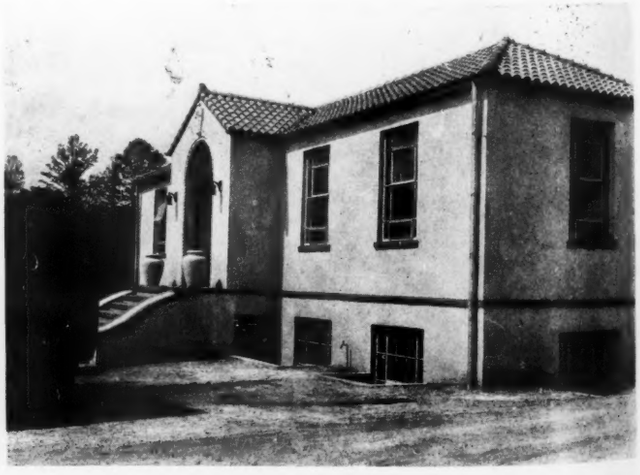
New clinker storage shed 240 ft. long and 75 ft. wide.

Harnischfeger crane of 6-ton capacity.

One Babock & Wilcox waste heat water tube boiler, of 1000-kw. capacity.

General Electric turbo-generator rated at 2500-kw. output.

Left to right—A. A. Holm, engineer; N. V. Geyer, chemist; C. C. Miller, superintendent, and J. A. Grubb, chief clerk



The cement plant office of natural color cement stucco with red concrete tile and red brick trim and tile floor

Three New German Sand-Lime Brick Plants in Hamburg

Simple Design Facilitates Operation—Interesting Loading Device — Special Shipping Trucks and Trailers

By George Wegner
Consulting Engineer, Elbing, Germany

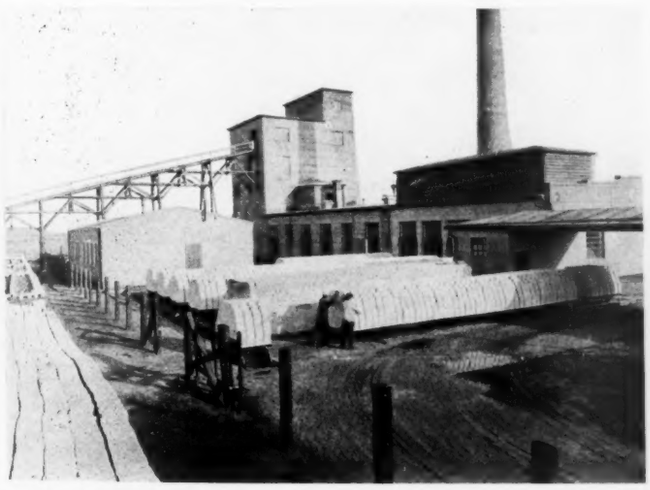
THE sand-lime brick industry has made tremendous progress within the last few years. In 1924, 300,000,000 sand-lime brick were manufactured annually in Germany. This output was increased to 560,000,000 in 1925 and the annual production of sand-lime brick in Germany today is estimated to be more than 1,000,000,000.

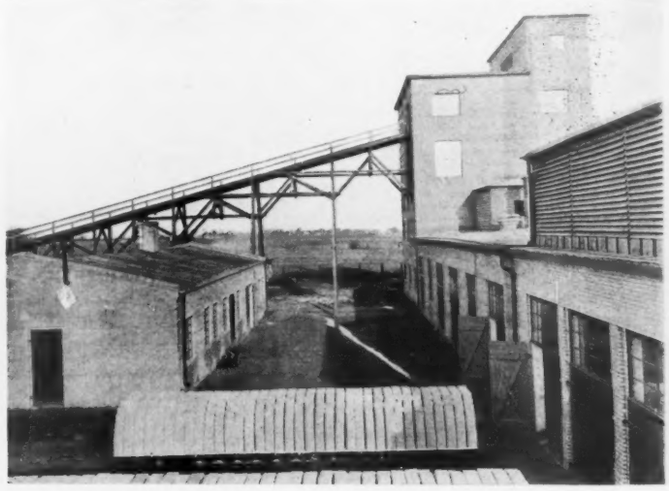
Particularly rapid progress was achieved by the sand-lime brick industry in Hamburg. Three new plants were built there during 1926, all of which operate in accordance with the Komnick quicklime drum process. Due to the growing demand for sand-lime brick, these plants have already been enlarged.

The cuts below show the front and the back views of the Phoenix sand-lime brick plant in Eidelstedt, equipped with three Komnick type 1-B automatic brick presses. Each press produces 26,352 brick per 10-hr. shift, so that the total production per shift is 79,056 brick. The brick have the Hamburg standard dimensions: 218x103x65 mm. (about 8½x4x2½ in.). As the plant operates continuously with two shifts, the daily production amounts to 158,112 brick. The plant buildings are built entirely of sand-lime brick, as may be seen by the illustrations.

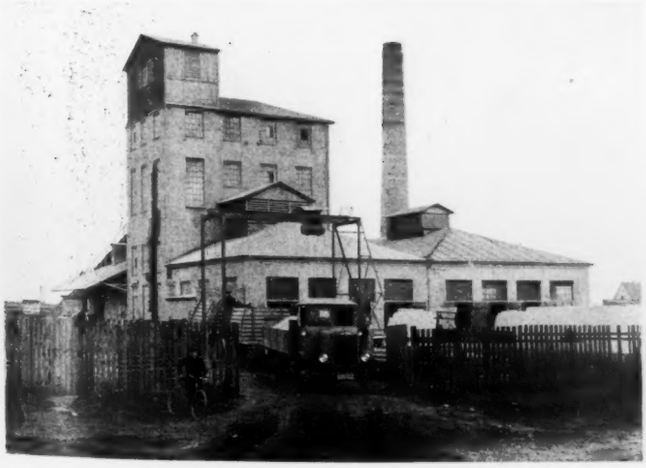
Simple Plant Layout

The plan layout shows how simply the three new sand-lime brick plants at Hamburg are built. The sand is taken from a near-by pit and transported to the factory in dump cars, where by an incline *a* they are carried to the top floor, and dumped into a screen *b*. The screened sand drops into the sand hopper *c* directly above the mixing drum *k*. Ordinary burned lump lime is passed into the feed funnel of the ball mill *d*, which thoroughly grinds it and the powdered lime





Two views of the Phoenix sand-lime brick plant, Eidelstedt, Hamburg, Germany



Bramfeld sand-lime brick plant, Hamburg

Achsenzoll-Harkscheide sand-lime brick plant, Hamburg

is conveyed by means of an elevator *e* to the air separator *f*. The air separator *f* permits only the properly prepared lime to pass on while the core or oversize is automatically returned through a chute *g* to the ball mill for additional grinding. The ball mill is encased in a close fitting metal jacket, thus insuring an almost entire absence of lime dust. The powdered lime collects in one compartment of the air separator and is automatically conveyed to the lime hopper *h*. These constitute the first steps in the preparation of the raw materials.

Mixing drum at the Phoenix plant

The funnel-shaped lime hopper *h* is equipped with a weighing and measuring device *i* by which the exact amount of lime required for a given number of brick is measured and then conveyed by means of a screw *j* to the mixing drum *k*. The weighing device can be so adjusted that no more lime than necessary is used; the quality of sand determining the amount of lime required.

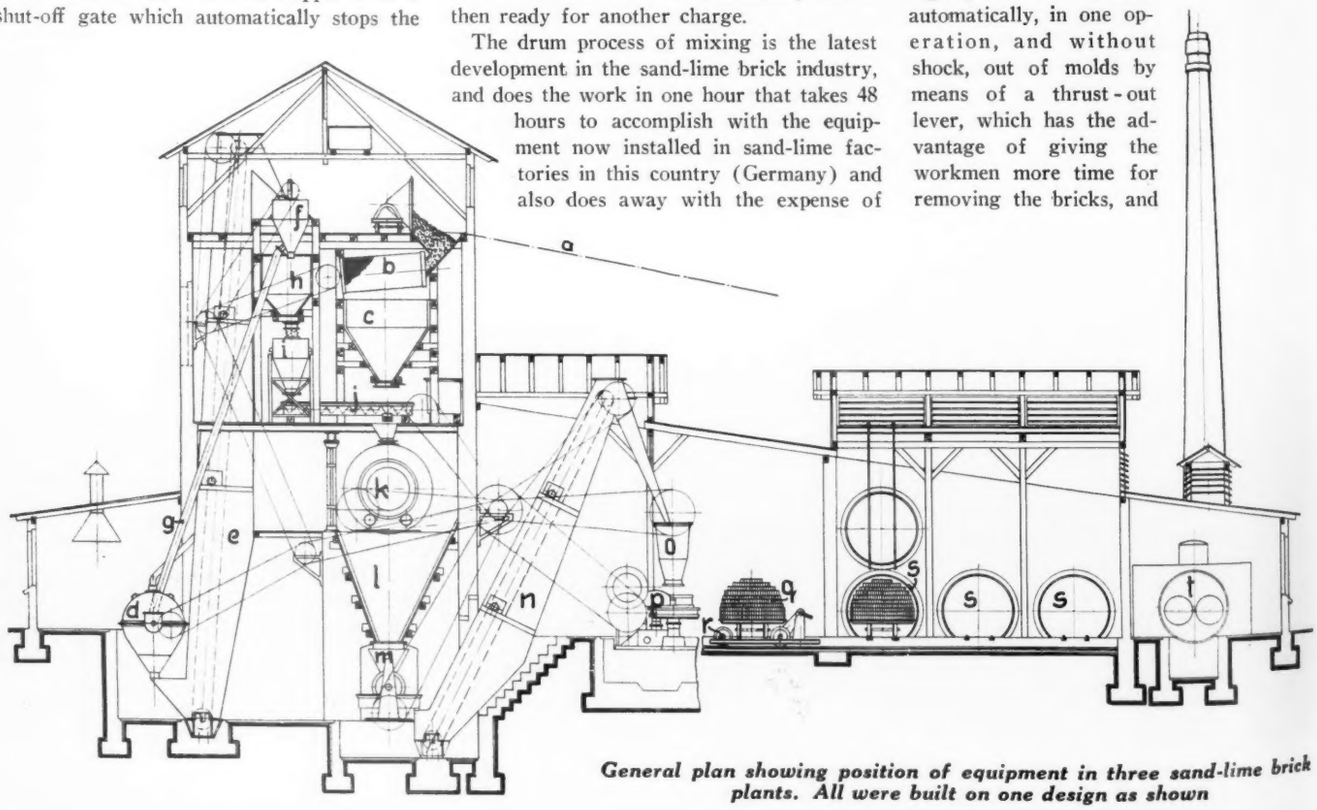
At the base of the sand hopper *c* is a shut-off gate which automatically stops the flow of sand into the mixing drum *k*. After the required amount of sand and lime is in the drum, the cover is bolted and water admitted in a measured quantity as fixed by test, and the drum set in motion, making about one revolution every four seconds. A safety valve prevents the steam pressure from becoming too great. The mixing and slaking is completed in about one hour, depending upon the quality of lime. The steam pressure gradually decreases until the slaking is completed, when the steam is allowed to escape through blow-off valve. As soon as the cover is removed from the mixing drum *k* it is emptied by a few revolutions, into the mixture silo *l* underneath, and is then ready for another charge.

The drum process of mixing is the latest development in the sand-lime brick industry, and does the work in one hour that takes 48 hours to accomplish with the equipment now installed in sand-lime factories in this country (Germany) and also does away with the expense of hydration of lime, erection of large steel storage tanks for lime and sand and storage bins for hydrated lime. By its use the factory interior is free from the lime dust nuisance.

Rear view of Ochsenzoll-Harkscheide plant showing incline up which raw materials are carried

The mixture then passes automatically and directly into the distributing device which is attached to a horizontal mixer or to an edge runner mill *m*, in which the sand and lime are intimately ground together.

The sand-lime mixture is automatically conveyed by an elevator *n* directly into the automatic feeder *o*, which regulates its flow into the filling plan of the press *p*. The mixture after being under an extraordinary high pressure is pushed automatically, in one operation, and without shock, out of molds by means of a thrust-out lever, which has the advantage of giving the workmen more time for removing the bricks, and



General plan showing position of equipment in three sand-lime brick plants. All were built on one design as shown

placing them on the hardening trucks *q*.

The loaded brick trucks *q* are run by a self-propelling transfer car *r* into hardening cylinders *s*, the doors bolted and made steam tight, and the brick kept under a steam pressure of approximately 120 lb. for eight hours, after which they are removed and are ready for shipping.

Mechanical Loading

Not only were all the manufacturing operations proper planned to take place automatically to a large extent, but great stress was also laid in this plant on mechanical loading. The shipping of the brick takes place by truck and with trailers. The trucks are loaded by means of a Komnick electric hoist. The principle and operation of this device are illustrated herewith on this page. The hoist is driven by an electric motor with counter shaft which turns a vertical shaft provided with a gear, which sets in motion four other gears threaded on the inside. In the four gears are located vertical screws which support the platform and can raise or lower it. A special moving platform accommodating two loaded brick trucks is placed on the top.

In loading a truck, it is brought close to the electric hoist. The brick trucks are then raised so that their level corresponds with that of the truck or trailer to be loaded. The platform of the hoist may also be moved sideways to close any gaps between the two surfaces. Back of the bottom row of brick is placed a steel rail to whose ends is fastened a wire rope leading over the truck platform to a drum, which pulls the load on to the truck or trailer. A truck with two trailers may thus be loaded with 6000 brick in 15 minutes, so that 250,000 brick may be loaded daily during the usual loading time. Only two men are required for the operation of the hoist.

Above is shown the Komnick special brick truck and the special trailer. To prevent falling of the brick, they are surrounded by latticing, the so-called basket.

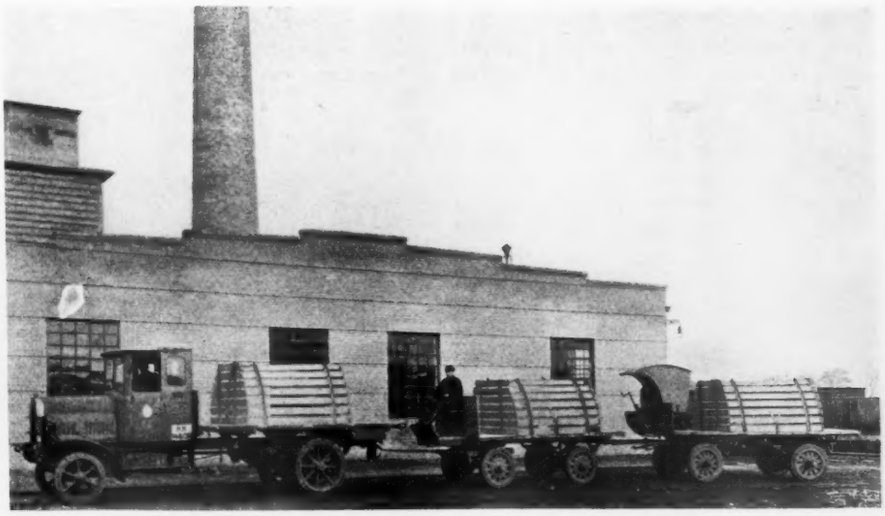
Small Operating Force

The number of employes is rather small due to the automatic operation of the drum process. Thus the Phoenix sand-lime brick plant employs but 27 men per shift producing 79,056 brick, which are distributed as follows:

Operation	Men
Sand pit	7
Sand hoist	1
Lime plant	1
2 mixing drums	1
1 mixer	1
3 presses	9
4 hardening cylinders	3
Steam boiler	1
Steam engine	1
2 mechanics, one for supervision	2
Total	27

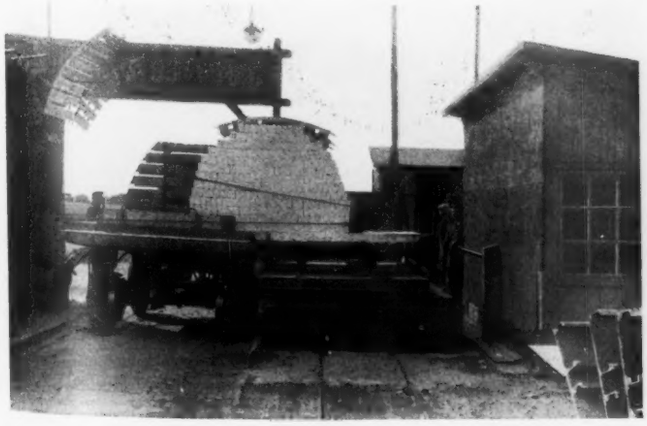
The same number of employes work during the night shift.

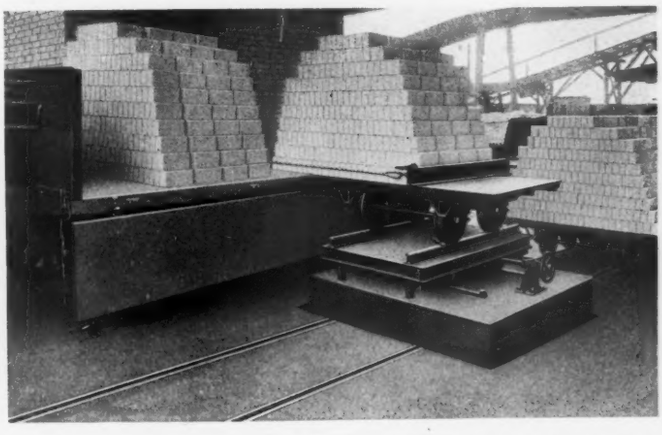
The Phoenix sand-lime brick plant is also a model of economic operation. It makes use of a condensing device comprising a first and second condensation filter, steam trap with control apparatus and the necessary piping for returning condensed water from hardening cylinders for further use. An installation of this kind is particularly valuable in sand-lime brick plants operated only in the daytime and where the brick harden at night. As in such cases no exhaust steam



Special truck and trailers for shipping finished brick

Electric platform hoist for loading brick with section removed to show operating mechanism





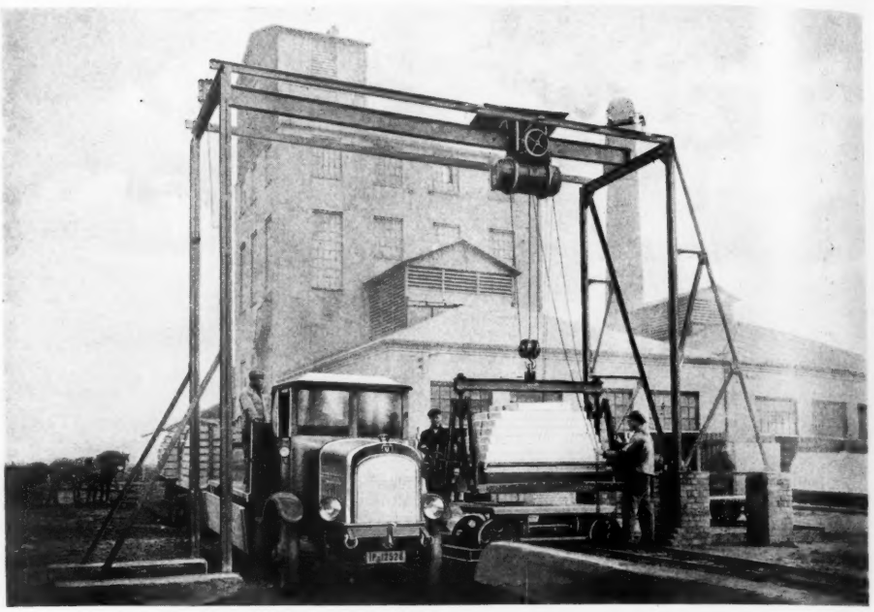
Illustrating the method used to load finished brick into trucks at the Phoenix and Ochsenzoll-Harkscheide plants

of the steam engine is available for the preheating of the boiler feed water, the fuel consumption is reduced by utilizing the condensed water of the hardening cylinders for boiler feed upon filtering it through the two filters.

The installation is also equipped with a special water container provided with tubes through which the exhaust steam of the hardening cylinders and of the steam engine is made to circulate, thus preheating the feed water of the boiler. It will be readily seen that preheating of the feed water results in greater economy. The coal consumption amounts to only 50 kg. (110 lb.) per 1000 brick. English lump coal is used for firing with heat value of about 7000 calories.

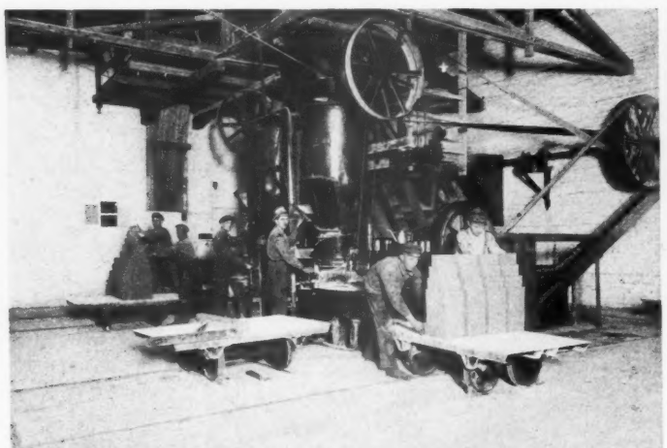
Three Plants Use Same Design

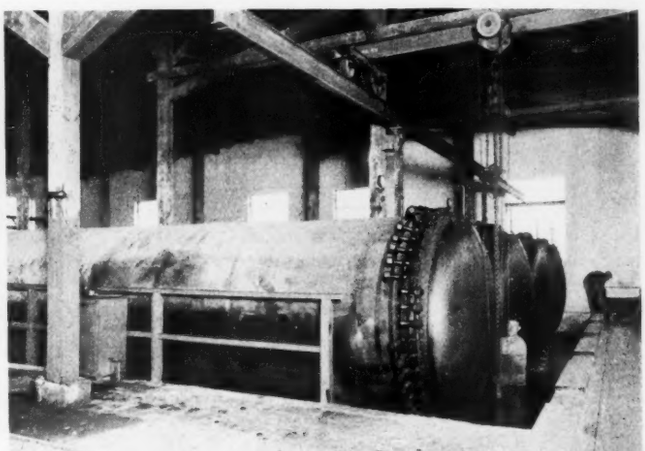
Another good sized plant, the Ochsenzoll-Harkscheide, also makes use of the Komnick quick-lime drum process and operates three large Komnick 1-A automatic brick presses producing 2500 to 2800 brick per hour. Nothing further need be said with regard to method of manufacture and output. The loading of the brick is by electric hoist and shipments by truck, all similar to the Phoenix plant.



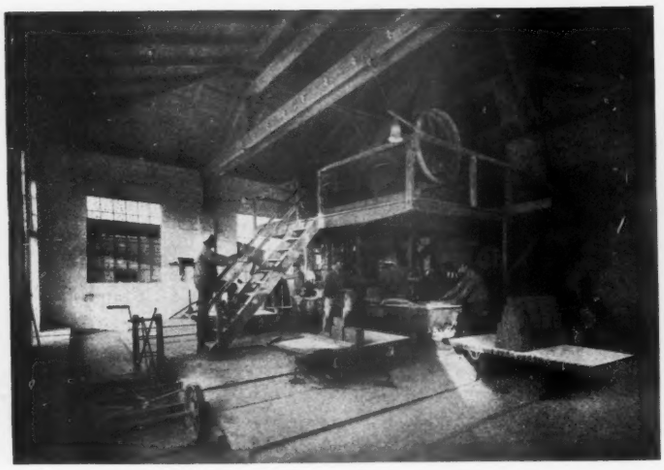
Another form of truck-loading used at the Bramfeld plant

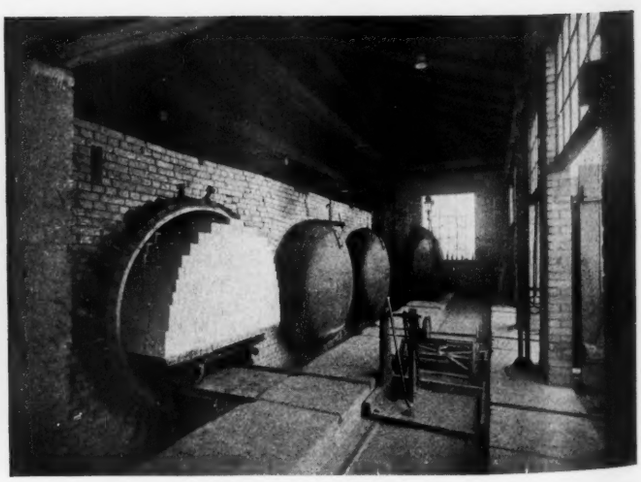
The third operation, the sand-lime brick plant Bramfeld, is equipped with two Komnick 1-B automatic presses. The Komnick drum process described above is also used here. The method of loading is by means of a special Komnick rapid-loading device. This



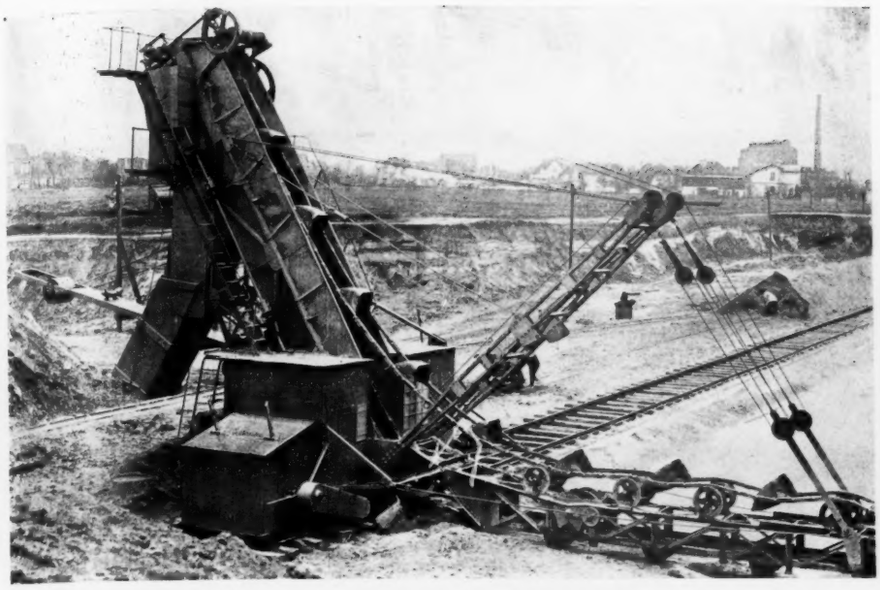


Brick presses (left) and hardening cylinders (right) at the Phoenix plant





Press room and hardening cylinders at the Bramfeld plant. The cylinders here are equipped with a self-propelling transfer car



An unusual type of excavator digging sand at the Phoenix company's pit

device is used in many European plants. About 120,000 brick are loaded daily at the sand-lime brick plant at Bramfeld by means of this machine with only two men.

The Komnick rapid-loading device consists of two steel beams which are protected by two compression plates and serve to grab the brick. Four levers, also of steel, press against the beams. The joints are designed to allow accurate centering and adjustment in case of wear, so that the life of this device is extended. The levers are operated by means of steel ties connected by U-shaped rods. Two levers are designed so that they may be moved horizontally through a hand wheel and chain and sprocket. The brick are thus shoved together on the truck platform. The same device is being made without the hand wheel to save space. The shoving of the brick together on the truck platform and the clamping of the brick in lifting them then takes place automatically through the weight of the brick pile itself.

The cut shows the loading device operating alongside of a traveling crane. The lifting and lowering of the brick pile is accomplished by an electric hoist.

A steam engine is used to furnish power in the three sand-lime brick plants described here. The generation of the steam for the hardening cylinders and for driving the steam engine takes place in a Cornwall two-flue boiler, 120 to 125 sq. m. heating area.

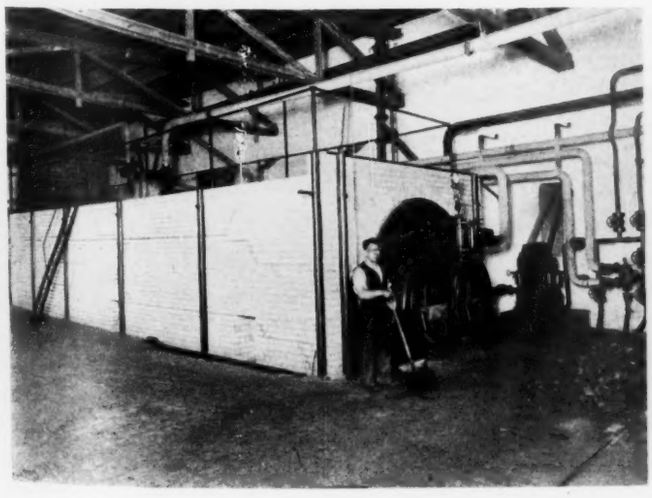
Re-use of Set Plaster of Paris

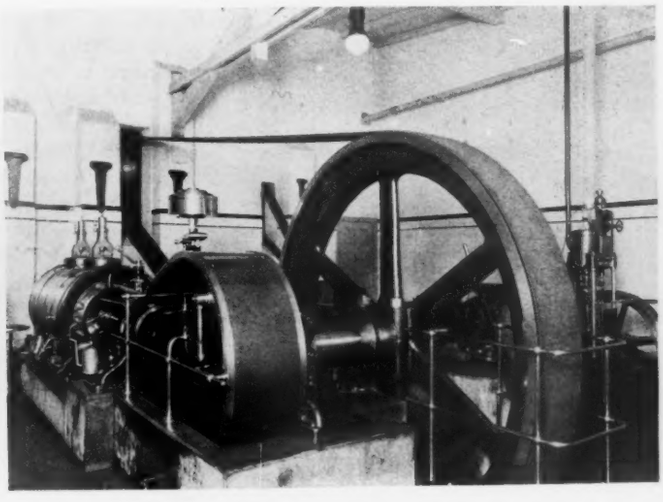
A RECENT article by Marie Farnsworth in *Industrial and Engineering Chemistry* on the re-use of plaster of paris molds contains information which is of specific interest to gypsum products manufacturers. These manufacturers often have some quantity of set plaster on hand which is sometimes ground up and used as accelerator. The amount used for this purpose is rather small, so often there is accumulated a waste pile which might be used to advantage. Recalcination of the set plaster yields a product which has a lower tensile strength than the original gypsum and this decreases even more on successive recalcining. Miss Farnsworth's study reveals that the reason for this loss in strength is due to the increase in size of the gypsum particles.

Based on this research, it has been found that additions of small amounts of aluminum oxide (as little as ¼ of 1%)

George Wegner, consulting engineer of Elbing, Germany

will cause the tensile strength to increase about threefold. X-ray photographs show that this addition causes the particle size to decrease, with a corresponding rise in tensile strength. The recalcined plaster (aluminum oxide added) has a lower strength than the original plaster and further decreases are observed with succeeding recalcinations.





Boiler room and 150-hp. steam engine at the Phoenix plant

Hints and Helps for Superintendents

Regulation of Flow in Crushing Plants

PROBABLY few crushing-plant operators fully realize the importance of a regular or uniform flow of material through the plant. Not only is a uniform flow essential to maximum capacity of the equipment, but a lack of uniformity in the flow—that is, feeding the material in gobs—is often responsible for poorly graded and dirty products. No piece of equipment in a crushing plant operates efficiently when overloaded, least of all a revolving screen.

Uniformity of flow starts at the feed to the initial crusher, because in most methods of quarry operation the feeding of the initial crusher by single carloads, or by train-

Feed hopper with apron conveyor bottom through which flow of stone can be regulated

loads, is bound to be intermittent; more so in the case of pit quarries with cable-operated car inclines than with quarries where the train has direct access to the crusher feed hopper. The crusher feed hopper may be made large enough to hold back the feed from one car dumping to another, or one train unloading to the next, but this is expensive in headroom and plant structure, and is not a method suited to revamping older plants.

It is, however, comparatively simple to install an apron-type feeder between the hopper and the crusher. The difficulty is to get a feeder rugged enough to withstand the usage it gets.

A good example of such a feeder was recently noted at the crushing plant of the Linwood Cement Co., Linwood, Iowa, and is illustrated herewith. The quarry cars are the side-dump type and are hauled up an

Signal bell over feeder operated by cord from feeding level of secondary crusher

incline by a cable. They dump into a hopper, the bottom of which is a pan conveyor, or apron feeder; so this feeder certainly gets about as rough treatment as one can get. It is a standard type of apron feeder, but it has been rebuilt by the stone company three different times, and there is probably not a pound of the original machine left. It is constructed now very largely of manganese steel. It has been proved, moreover, in this case, that a feeder *can* be built which will stand the racket.

This feeder helps the efficiency of the plant very materially. Its movement is controlled by a crusher tender through a lever which operates a slip clutch, so that it may be started and stopped as desired. This permits a regular feed to the initial crusher, in spite of the intervals between cars. It also feeds the larger pieces of rock to the crusher in the direction of their narrowest dimensions, which increases the efficiency of the crusher. The feeder itself, with a moving bottom and fixed sides, of course has a tendency to turn the stone so that the longest dimension will be parallel to the movement of the feeder, and during its course on the feeder hand bars can readily be used to help the turning.

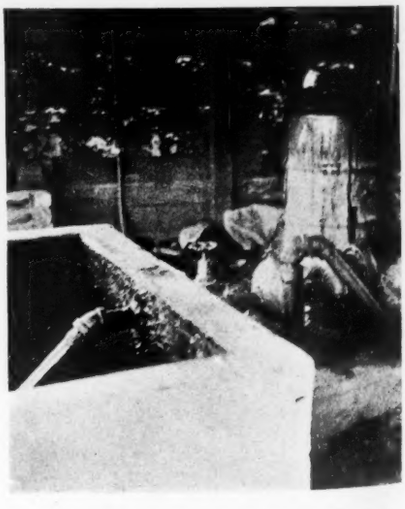
Uniformity of flow in this plant is also helped by a signal bell which hangs over the feeder and is operated by a pull cord from the feeding level of the secondary crushers. Thus the secondary-crusher tender may readily signal the primary-crusher tender, who controls the feeder, when material is piling up ahead of the secondary crushers, or when it is necessary or desirable to check or stop the feeding for any reason.

From observation of the working of this plant it is evident that the increase in efficiency, and the betterment of quality of product through adequate control of the flow of the material through the plant, are well worth the investment in labor and equipment.

J. F. Schroeder is secretary, treasurer and general manager of the Linwood Cement Co.; J. A. Thiessen is superintendent.

Water Tank for Serving Crane and Locomotives

AT the plant of the Montgomery Gravel Co., Montgomery, Ala., water is obtained from an artesian well which has not a heavy flow. The well runs into the concrete



Concrete collection tanks serve as water supply for crane and locomotive

tank shown here and then is pumped to the tanks from which the locomotive crane and the locomotives used in switching take boiler water.

The pump is set so that it will always be primed when the tank is full. By having the concrete tank act as a collector there is always a supply of water to be drawn upon whenever the boiler feed tanks need filling.

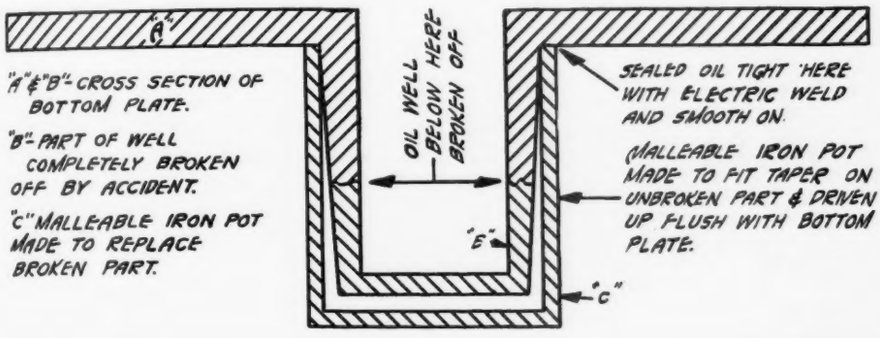
The same arrangement has been used when the water comes from the city mains through a small service pipe. This can be fitted with a ball-cock so that the water will be shut off when the tank is full.

Repairing Bottom Plate of a Gyratory Crusher

By W. L. HOME

Consulting Engineer, Pine Plains, N. Y.

THE part "B" was entirely broken off by accident and repairs were considered impossible except by putting on a new bottom plate which would have required at least two weeks to secure. This part of the bottom plate served only as an oil well and gave strength to the casting.


"A"
"A" & "B" - CROSS SECTION OF BOTTOM PLATE.
"B" - PART OF WELL COMPLETELY BROKEN OFF BY ACCIDENT.
"C" MALLEABLE IRON POT MADE TO REPLACE BROKEN PART.
OIL WELL BELOW HERE BROKEN OFF
SEALED OIL TIGHT HERE WITH ELECTRIC WELD AND SMOOTH ON.
MALLEABLE IRON POT MADE TO FIT TAPER ON UNBROKEN PART & DRIVEN UP FLUSH WITH BOTTOM PLATE.
"B"
"C"

The malleable iron pot was made to fit the taper on the casting when driven tight up against the bottom plate. An unsuccessful attempt was made to weld tight the crack between the cast iron and the malleable iron pot. After running the crusher the hot oil leaked through. The joint was then burned clean and scrubbed with a wire brush and acid and smooth-on applied. This made the crusher sufficiently good to operate for a year with no more trouble from this source. The cost was small and the time required about 10 hours instead of two weeks.

Repair Jobs

By F. J. MacDONALD

Cobleskill, N. Y.

IT is surprising the many concerns which pride themselves as just it, but will allow or have done some miserable or bum repair job. Something breaks, it must be fixed quickly, what will you use? Most anything. So a knotty cross-grained 2x4 is nailed up, where it should have a good one. Or an iron bolt is picked up and placed in a machine, where a properly fitted steel one should be used. I'll give a few illustrations.

Someone placed in the strap of a connecting rod of a large locomotive a poorly fitted iron bolt. The engine was used to deliver loaded cars down to the main line, one-half mile away. The other bolt in the strap had the nut or thread end broken off, and an effort was made by the mechanic to remove both and place new ones. The mechanic's helper was at other work, and the bolts would not move without more help. Orders came to move the cars, and the locomotive was sent out.

It made the trip down the line all right. The engineer was young, rather careless, and unobserving; for if he had looked at all he would have discovered that the iron bolt was broken and completely out.

The trip was started up the line with disastrous results. The rod let go and cracked the cylinder head on the piston end, blew the front cylinder head and studs and broke the piston head and rings. A few days later the L valve was uncoupled and set dead over ports. It was steamed and by starting it with a caterpillar tractor it was run (empty) to the shed. The repair cost around $250, all because of the use of that iron bolt.

I have in mind a shaker screen that was fitted with 1-ft. by 1x4-in. *steel* connecting rod. After the eccentrics became worn the rod broke and as the company had a good supply of *iron* rods on hand they were used. They were 16 in. long, and had to have a thread of 7 in. on one end and 5 in. on the other. It was necessary to thread them by hand with a large stock and die. It required two men a half day to make a set and they would break two to three times a week.

When good steel was secured the trouble was ended. I did a repair job on a steam shovel sometime ago. It was a broken I-beam. It had been electrically welded by a novice and broken again (and I wish to say that the electric weld is the best possible way for such a repair). If properly done by an expert the beam should have been stronger than ever. In this case the plate method was used. The local machinist had been up to measure it, and the plate was ordered ¾ in. thick. He had attempted to plane it to the right width, and some of the holes were a half the diameter of a hole from where they should have been. I found it necessary to trim both sides of the plate with the cutting torch and burn some of the large holes to fit.

We finally finished a reasonably good job. With the exception that the plate was too thin. It should have been at least 1⅛ in. thick. A few extra dollars cost for thicker iron would have meant a permanent repair.

It is reported that it held until they had to dig frozen ground again and then a break meant repeating the operation or placing a new beam.

Of course emergency repair jobs have to be done, but it is best to use a reasonable amount of judgment in making them. If life and serious property damages are at stake go cautiously. I have seen repair jobs done that would make you shudder. It was apparent to any novice that they would not stay. I know of an exhaust fan repair job that was wrongly done under the supervision of a smart superintendent, and it cost the firm several thousand dollars before they got through with it.

Holding a Pontoon Line

THE dredge of the Underwood-Walker Co. near Prattville, Ala., has a fairly long pontoon line connecting it with a booster pump on the shore, by which the sand and gravel is pumped up into the washing plant. The joints of the pipe line were the usual rubber sleeves and gave no trouble under ordinary working conditions. But when a high wind blew against the side of the line, as it did on one or two occasions, the pipe line parted.

In order to insure that this would not happen again an old cable was stretched the full length of the lines on the pontoons and fastened securely at the dredge and at the shore end. The pontoons were tied to this

and a tie was also made on each side of a joint in the pipe line. When this was completed there was no way for the pipe line to pull apart without breaking the cable.

This pontoon line has withstood several high winds since the cable was put on, and undoubtedly it would have parted without the cable.

D. Swan, the manager of the plant, is responsible for the idea.

Gradation of Machine-Broken Stone*

Part VI. Effect of Intermittent or Irregular Feeding on Composition of Product

By Wm. T. W. Miller
Sheffield, England

IT is well known to most users of crushing machinery that intermittent or irregular feeding vitally affects the composition of the product. This is especially noticeable with worn or smooth crushing surfaces which normally control only one dimension. The light feed increases the proportion of flakey pieces which are free to escape without breaking one on the other, and, when any laminated material is being crushed to a relatively coarse size the number of slabs in the product is sometimes a serious detriment.

To obviate this it is not unusual to allow the feed to accumulate so that the machine may operate for a certain period under flood conditions, the result being that the choke feeding gives a finer product due to the thin flakes becoming interleaved and breaking on each other. The packing of the interstices also reduces the chance of the free passage of a thin slab through the crushing cavity without being fractured.

The writer would have been glad to include a diagram illustrating the change, which it brought about by "choke" crushing but authentic data are hard to obtain. The record must be made about the middle of the crushing period, when the influence is at its height, but possibly some of our quarry friends may be able to add such a record to this collection of comparative results.

A good deal of the trouble experienced with crushing machinery is caused by attempts to reduce the percentage of oversize or to force the machine to make a reduction greater than the economic ratio.

It will usually be found that both the repair bill and the power consumption are less if the machine is adjusted to give a moderate amount of rejects, and in many cases the output from the plant can be largely increased, with small addition to the horsepower, by screening out the oversize and recrushing this in another machine.

In this connection the gradation curves may be used to advantage in conjunction with carefully weighed output tests and Diagram 19 is included to illustrate this.

Comparing Tests Nos. 1 and 3 on the vertical disc crusher, the former gave 60% of the product between ¼ in and ¾ in. and 18% below ¼ in., the latter 63% between ¼ in. and ¾ in. and 33% below ¼ in., but

*Copyright, 1927, Wm. T. W. Miller.

Parts Already Published

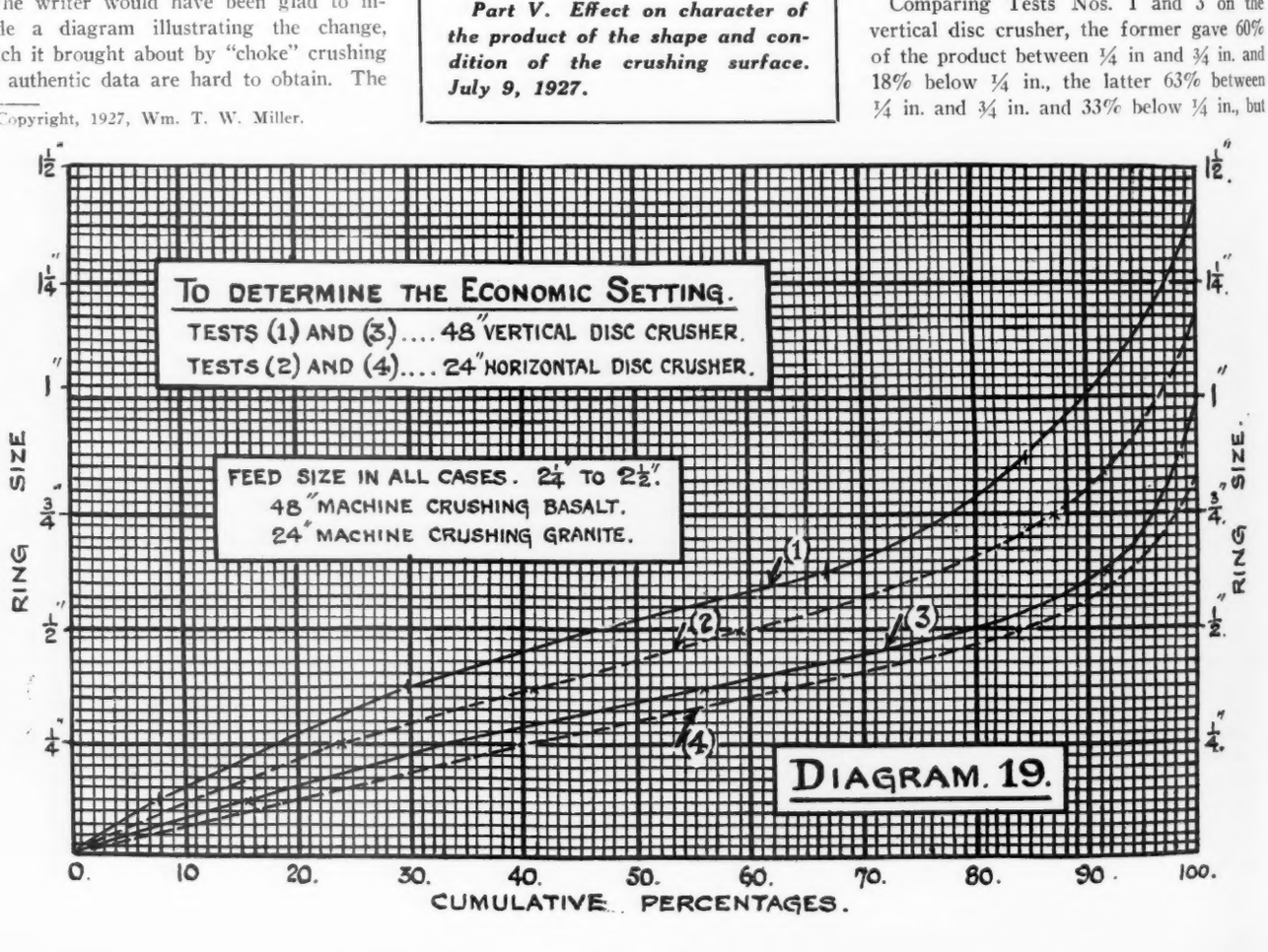
Part I. A thorough study of the percentages of sizes produced by jaw and gyratory crushers working on hard and soft rocks under usual conditions, March 19, 1927.

Part II. Study of the percentages produced by jaw, disk and roll crushers, a study of different machines operating under similar conditions. April 16, 1927.

Part III. Effect of variation in feed size. Single stage and double stage crushing compared. Crushing in closed circuit with a screen. May 14, 1927.

Part IV. Effect of variation in the crushing stroke. Typical jaw crusher and disk crusher tests with different jaw movements. June 11, 1927.

Part V. Effect on character of the product of the shape and condition of the crushing surface. July 9, 1927.


TO DETERMINE THE ECONOMIC SETTING.
TESTS (1) AND (3).... 48" VERTICAL DISC CRUSHER.
TESTS (2) AND (4).... 24" HORIZONTAL DISC CRUSHER.
FEED SIZE IN ALL CASES. 2¼" TO 2½".
48" MACHINE CRUSHING BASALT.
24" MACHINE CRUSHING GRANITE.
RING SIZE
1½" 1¼" 1" ¾" ½" ¼"
0. 10 20. 30. 40. 50. 60. 70. 80. 90. 100.
CUMULATIVE PERCENTAGES.
(1) (2) (3) (4)
DIAGRAM. 19.

the output in Test No. 1 was at the rate of 60 tons per hour with a consumption of 45 to 50 b.h.p.., whilst Test No. 3 gave about 40 tons per hour at 75 to 80 b.h.p.

The coarser setting gave an increased output of about 50% over and above that obtained in Test No. 3 with about 50% less power.

In the case of the smaller horizontal disc crusher, Test No. 2 gave 63% between ¼ in. and ¾ in., and Test No. 4, 58% of the same material the outputs varying from 12 to 8 tons per hour. It was difficult to gauge the difference in power but the increase for the finer crushing was about 20%. The net gain of the required material in Test No. 2 was 63%.

In every instance where the composition of the product is a matter of some moment a careful study of the gradation diagram combined with details as to output and power consumption will well repay the plant superintendent.

Summary of the Conditions That Affect the Gradation of Sizes

Although this series of sizing tests is interesting, as covering some part of the field of crushing operations, is it admittedly incomplete, and the results obtained may not be applicable to some particular problem calling for immediate solution, the conclusions reached may however be summarized as follows:

The variation in the gradation curve due to differences in the character of the stone or ore it not so great as is frequently imagined, within the range of free-breaking homogenous materials.

The statement that the type of crusher has a controlling influence on the product requires some modification. The character of the crushing surfaces is more important.

The extent of reduction, or the amount of work done on the material, affects the proportion of the finer sizes, but this is only true for free breaking without packing.

Stage crushing with intermediate screening reduces the proportion of fines made in the crushing process, but this is not very noticeable when breaking to the coarser sizes.

The results obtained from a closed circuit are generally similar to those reached by stage crushing with intermediate screening.

There is, however, some danger of the rejects flooding the circuit and introducing the condition of choke crushing

In the reciprocating breaker the extent of the crushing stroke has an important bearing on the character of the product, and this is emphasized when crushing to the finer sizes.

The conformation of the crushing faces, and the alterations brought about by wear, have most serious influences on the gradation diagram.

Choke crushing, by packing the material into a dense stream and compressing the ribbon so formed, introduces a new series of conditions which alter the composition of the product.

Crusher Openings

THE EDITOR—In reply to the point raised by one of your correspondents that it would have been helpful if the setting of the crusher had been specified for each test in my series of articles, I would remark that this question of the crusher setting can be very misleading, particularly in those cases where the crushing faces are toothed or corrugated.

In the diagram, the gyratory used had a corrugated head and corrugated concaves and the pitch, shape and depth of the serrations were not the same in the head as in the concaves. The maximum and minimum settings are usually measured from the surface of the cone at the sizing point to the minimum diameter of the concaves, but if these dimensions are taken from tip to tip or tip to root of opposing flutes they make no allowance for variations in the contour of the corrugations.

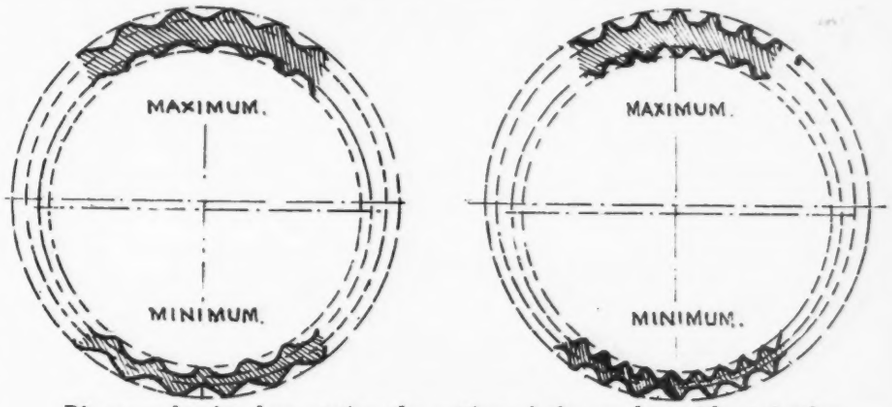


Diagram showing how stating the setting of the crusher without further explanation may be misleading

It is a well-known fact that the character of the product will depend very largely on the conformation of the sizing and discharge areas, and a little study of the two diagrams herewith will serve to show that, with similar crusher settings, not only the effective shape but the actual area may vary considerably.

Showing how the opening varies with different corrugations

The same may be said of the jaw crusher. To specify the setting without giving full particulars of the teeth is of very little value. See my sketches above.

WM. T. W. MILLER.

Sheffield, Eng., April 9, 1927.

Talc Production in 1926

THE total quantity of talc sold by producers in the United States in 1926 was 181,568 short tons, valued at $2,110,994, according to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by the producers. The figures comprise 5988 tons of crude talc, valued at $26,723, 1528 tons of sawed and manufactured talc, valued at $130,253, and 174,052 tons of ground talc, valued at $1,954,018. The total quantity was slightly less than in 1925, but the total value increased 5%. There were 21 producers of talc in 1926, two less than in 1925.

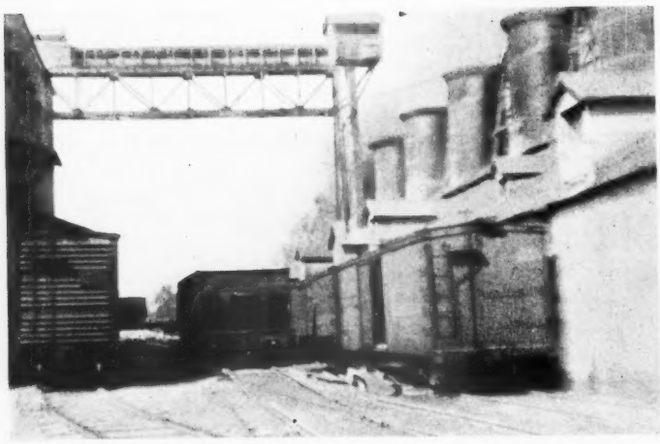
Of the total quantity sold, New York supplied 83,231 tons, valued at $1,030,075, as compared with 85,109 tons, valued at $993,913 in 1925; Vermont supplied 53,510 tons, valued at $514,527, as compared with 54,883 tons, valued at $533,603 in 1925; and California supplied 15,419 tons, valued at $233,292, as compared with 14,883 tons, valued at $194,975, in 1925. The remainder of the output was produced by Georgia, Maryland, New Jersey, North Carolina, Pennsylvania and Virginia.

Imports of talc for consumption in 1926 were 23,846 short tons, valued at $540,082. Corresponding figures for 1925 were 20,993 tons, valued at $450,532.

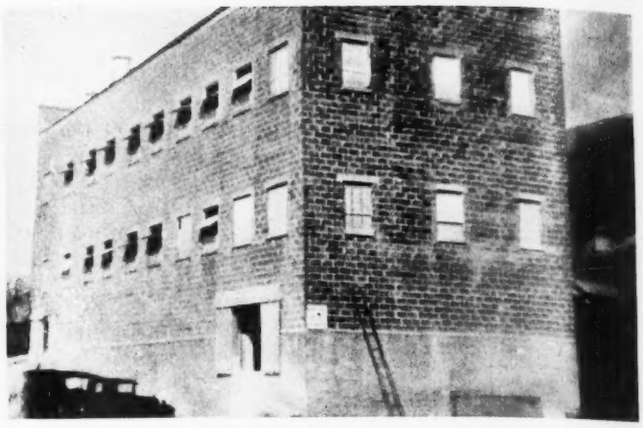
Cost of Producing Stone

A DETAILED REPORT of cost analyses of operations at a number of quarries of different sizes, involving production of broken stone from various kinds of rock, and discussing general conditions which affect cost, has been prepared by George E. Ladd, economic geologist, Bureau of Public Roads, and published by the United States Department of Agriculture as Miscellaneous Circular 93-M, "Direct Production Costs of Broken Stone." The report describes in detail the character of each of the quarries and gives direct costs of the various operations, such as stripping, drilling face, breaking boulders by various methods, face blasting, etc. Some quarries, where methods of operation were changed after the studies were made, were studied during the following season in order to compare the two methods of operation. Tables on detailed costs for each quarry are followed by analyzing tables and discussions.

A copy of the circular may be had from the United States Department of Agriculture, Washington, D. C.



Lime plant and hydrate plant connected by elevator and conveyor

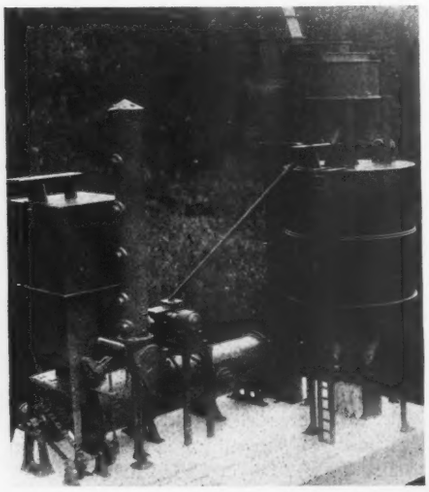


The hydrate plant. Allowance has been made for future expansion

Chemical Lime Company's New Hydrating Plant

By George M. Earnshaw

THE Chemical Lime Co.'s operation at Bellefonte, Penn., was started in 1907, so it is fitting that it should be described, at least in part, in the year of its twentieth anniversary. In those 20 years many changes and additions have been made, the most recent being the building of a modern hydrating plant, which is said to be the only unit of its kind in this country.



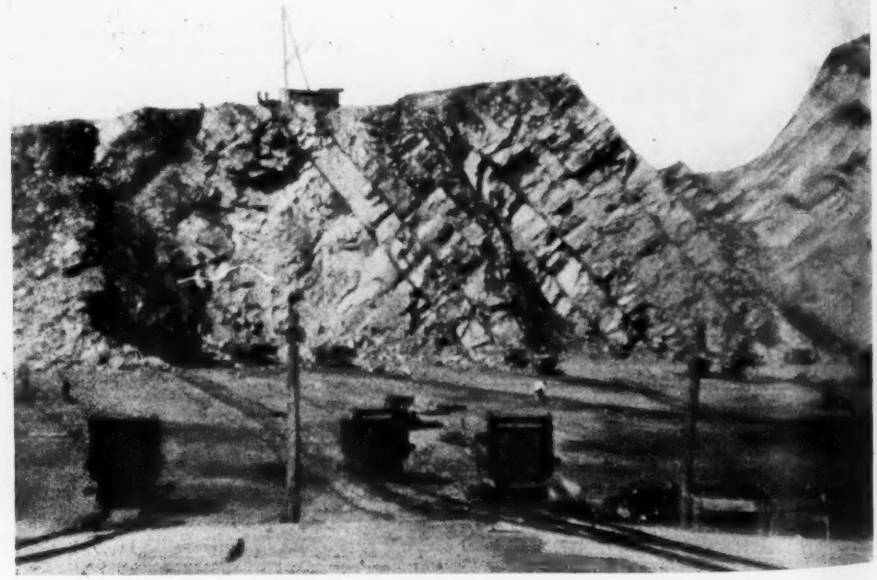
The hydrate plant is exactly like this model excepting that it has two separators instead of one shown here

Undoubtedly this new hydrating plant is unusual; so much so in fact, that its owners are reluctant to let outsiders see its inner workings. For that reason we are unable to go further, in describing the plant, than to give merely an undetailed description.

The most important part of the plant is the hydrator itself, for it will hydrate lime, it is said, in any size from pulverized to lump, and has a capacity of 100 tons per day. Another important feature is the screening equipment, which makes for flexibility in separating into pebble lime, pulverized lime, or lime to be sent directly to the hydrator.

Briefly, the plant consists of an enclosed chain-bucket elevator and 14-in. spiral conveyor, which deliver the lime from the plant proper to the hydrate plant. The spiral conveyor discharges direct into a Hum-mer screen, which is equipped for three separations. From the screen the lime is conveyed to two 100-ton steel tanks—one for pebble and one for ground lime. To take care of an excessive demand for ground lime, there is installed a McGann hammer mill. The lime is fed direct from the storage tanks to the hydrator from which it is elevated and conveyed to steel tanks over the bagging machines. Three kinds of hydrate are produced: "Three Star," a super hydrate; "Diamond," a chemical hydrate, and "Clover," a mason's hydrate. There are two Bates 4-valve bagging machines and at present only one loading track. Later, another loading track will be put in on the opposite side of the building. Everything is laid out so that the plant's capacity can be doubled simply by the installation of another hydrator and an adjustment of the speeds of the elevators.

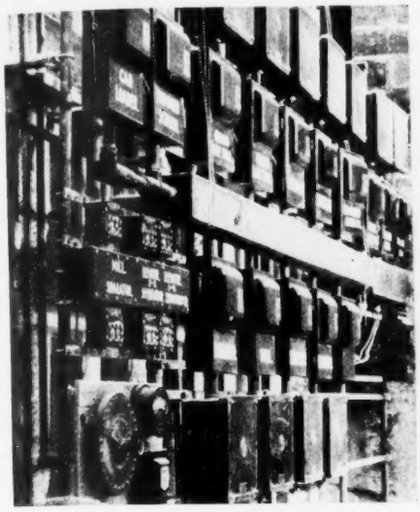
The hydrate plant is completely under one roof. The building is of brick and steel construction and is 103 ft. long, 35 ft. wide and 59 ft. high. It is electrically equipped throughout, all units direct driven. The electrical equipment, including the motors,



Partial view of the quarry. The kiln stone is hand-loaded while stone for the crushing plant is loaded by power shovels

switchboard, and other control equipment, was furnished by the General Electric Co. The hydrator is a Schulthess and it, together with the tanks, hammer mill, elevating and conveying machinery, was furnished by the McGann Manufacturing Co., York, Penn. Wm. J. Kuntz, general manager of the McGann company, designed and built the plant in co-operation with the Chemical Lime Co.'s own engineers.

The quarry, crushing plant, and lime kilns have, as mentioned above, been operated for many years. The face of the



Switchboard control extends to every operation at the plant

quarry averages approximately 100 ft. in height and is about one-half mile long, running in horse-shoe shape. Drilling is done with a Loomis electric well drill and secondary drilling with Ingersoll-Rand and Sullivan drills. Stone for lime burning is hand loaded while stone for the crushing plant is loaded by three ¾-yd. Erie steam shovels.

The primary crusher, a 42x48-in. Traylor jaw, is located in the quarry which is connected with the crushing and screening plant proper, by a 32-in. conveyor. A No. 7½ Traylor gyratory crusher and two Jeffrey hammer mills take care of the secondary crushing. All units in the crushing and screening plant are individually driven by General-Electric motors. The plant has produced 2000 tons of crushed stone per day, but is said to have a capacity for more than this tonnage.

Hand-loaded stone is hauled to the kilns in 3-ton end-dump cars, with revolving bodies, and is dumped directly into the kilns. There are ten kilns of the Shope design, 14 ft. in diameter and 50 ft. high. They have a rated capacity of 10 tons per day of good quality lime.

Officials and operating staff are: A. C. Mingle, president; A. R. McNitt, vice-president; J. S. Walker, secretary-treasurer and general manager; R. S. Walker, assistant general manager, and S. H. Smith, superintendent. The main office of the company is at the plant.

Alkaline Treatment of Leucite for Potash

LEUCITE is a crystallized double silicate of potash and alumina, which because of its potash content has been a subject of much investigation in Europe and the United States. In a recent issue of *Chaleur et Industrie*, M. F. Jourdan describes an alkaline treatment of rock leucite which produces caustic potash, potassium carbonate, alumina and potassium chromate, in sufficient quantities and at a cost which offers commercial possibilities. An abstract follows:

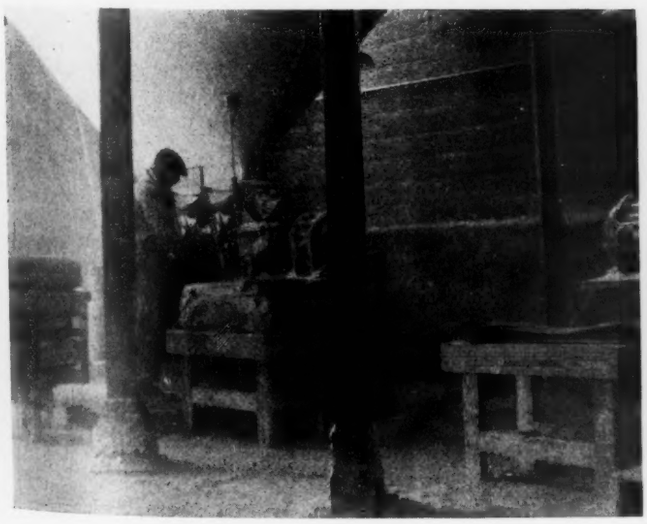
The Italian Potash Co. has established its first plant at Roecamonfina volcano, near Gaughano. The beds, varying from 7 ft. to 26 ft., are cut in blocks, crushed and ground in a tube mill. Magnetic separators are used to lift out the gangue from the ground product and leave the leucite grams. This granular form is used for chemical purposes. Further crushing yields a material quite suitable for fertilizer as tests have shown.

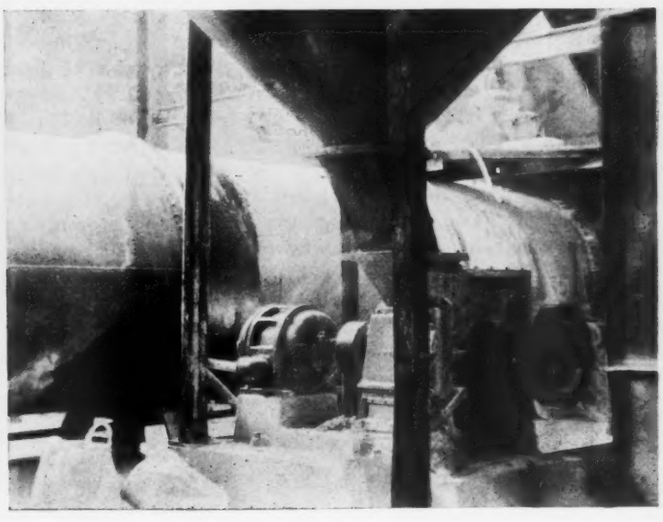
Two processes are proposed for utilization of leucite. The first dealing primarily with the recovery of potash follows: Pulverized leucite (100-mesh) is mixed with slaked lime, the whole placed in a kettle equipped with agitators and heated with agitators for from two to six hours, after which the mass is removed to a rotary filter, the filtrate collected and the filter calcined to yield a white cement. The filtrate contains about 50 to 60 grams of KOH per liter of solution. The alumina is not extracted in this process. The yield of potash hydrate is given as about 440 lb. per short ton of rock treated.

The second firing process makes possible the withdrawal of the potash at the same time with the greater part of the alumina contained in the leucite. A mixture of limestone, leucite and iron oxide flux is brought to a fusion point. In the course of slow cooling the mass spontaneously pulverizes and is then lixivated and filtered. The filtrate is a potash aluminate solution and the residue a bicalcium silicate. The chemical reactions on further study have been shown to be a function of lime and temperature; increases of temperature, decreasing reaction time and changing the chemical nature of the resulting compounds. The yield of potash and soluble alumina is in direct proportion to the cooling time, rapid cooling of the fused mass by compressed air decreasing the yield of the soluble salts which are desired.

Other experiments with an electric furnace have resulted in a recovery of from 80 to 90% of soluble potash. From a rich leucite a yield of 528 lb. of pure K_2CO_3 and 375 lb. of anhydrous alumina per short ton of raw material is claimed. The alumina produced is free from iron and contains very small amounts of silica.

Other potash salts are produced by the introduction of suitable materials to the leucite-limestone combination. The addition of chromite yields a potassium chromate in satisfactory quantities.





Left—one of the two packing machines. Right—The hydrator and hammer mill. Any size of lime can be fed to the hydrator

Washington Silica Rock Deposit Leased for $1 a Ton

THE *Wenatchee* (Wash.) *World* says that H. B. Smith of Merritt, Wash., has leased a silica rock deposit to the Northwest Mineral Products Co., of Tacoma, for a royalty of $1 a ton. The quarried rock will be brought to Tacoma for grinding. The product will be used in Washington steel mills and paper mills.

At present the ground silica used in the Northwest is imported, and the same paper says it costs $16 a ton to lay down in Tacoma. The grinding plant will be in Tacoma rather than at the quarry, on account of the saving in freight.

Material Men Should Beware of "Broker-Builder"

CURRENT correspondence between Richard Deming, vice-president of the American Surety Co., General R. C. Marshall of the Associated General Contractors of America, and Commissioner Dwight H. Blackwood of the Arkansas Department of Highways shows in an incidental way how the hard-pressed, big-city speculative contractor-builder is planning to get back on his financial feet, writes Allen E. Beals in the current *Dow Service Daily Building Reports.*

The flood-blighted South has come to know him as a "broker builder," or a foreign corporation that takes large reconstruction contracts in the bulk, depending, in turn, upon job-hungry sub-bidders to take the actual field work at prices where promises pinch-hit for profit, listing only sub-contractors who believe certain false representations concerning the protecting power of the security bond.

The people of the flood-lands want speed and efficiency in their reconstruction programs and are adopting rather extraordinary methods of getting them, if the announced policy of the state of Arkansas is a criterion of what the other flood-devastated states are going to do about "broker-builders," so that the firms now organizing here and in other big cities for the purpose of going into the South to recoup individual or corporate losses on speculative building projects during the late boom will find it well prepared to meet the maneuvers of foreign corporations whose officers have no intention of actually doing the building work, but who expect to make large profits by obtaining contracts and subletting them.

Not only are such firms being required to file lists of equipment they own for handling work of the scope and size advertised for, but they will have to give a financial statement of their assets and liabilities, their credit positions, and a report on the jobs they have done of a similar nature elsewhere. In other words, proof is being required of each bidder's ability to complete quickly, and without litigation or delay, the work entrusted to them.

Furthermore, it has not been considered sound public policy to depend upon the contractors' surety bond alone.

"When the chief reliance is placed upon a bond and not upon the character of the construction company," says Commissioner Blackwood in his joint note of warning with Chief Engineer G. Hunter Sykes to foreign corporations now forming in big cities to crash the South, "trouble usually results.

"Bonding companies merely pay the cost of completing the unfinished work of incompetent and defaulting contractors," the statement goes on to say. "They never pay any part of the expense incurred in the long delays which arise in instances of defaulted contracts, nor is the public ever repaid for the inconveniences suffered through such.... It is necessary always to have a bond to protect the state, but the bond should be the last reliance and not the first."

"In this," wrote Mr. Deming, who, as an active member of "The Committee of 27," formed early last year for the purpose of bringing about higher standards of business practice in the building trades of New York, has spoken and written extensively on the subject of better credit relationships and contractual standards, "your action follows our ideas exactly. We assert that a surety bond executed for a contractor does not of necessity or otherwise guarantee the sufficiency of the contractor's price, nor his experience, nor his financial responsibility; that the execution of a surety bond for a contractor does not guarantee that the contractor will not default or that he will do all that is called for in his contract, any more than a burglary policy guarantees that the holder of it will not be robbed, nor a fire insurance policy that a house will not burn down, nor a fidelity bond that an employe will not steal. The obligation of a surety bond in its final analysis is only to indemnify against loss by reason of failure of the contractor to carry out the terms of the contract."

Mr. Deming holds that the principles developed by Commissioner Blackwood in Arkansas apply equally in New York or any other large building center, and, quoting from a speech he delivered before the recent Washington convention of the National Association of Builders' Exchanges, he added:

"If I were a material man or a subcontractor, I do not believe I would extend credit to a general contractor on the strength alone of the general contractor's statutory bond executed by any surety, personal or corporate; but if the material men and subcontractors are willing, in order to make sales, to rely upon such statutory bonds as a basis of credit (a form of credit guarantee for which they pay nothing), they should understand the difficulties which are sure to confront them when they undertake hurriedly to collect their bills for materials and labor from a surety for a general contractor on such statutory bond, for such a bond is merely an instrument of indenmity, and not an insurance policy."

Two States Making Agstone With Prison Labor

IOWA and Missouri now have state-owned plants for making agricultural limestone in which convict labor is employed. According to the Cedar Rapids *Republican* the Iowa plant, which is at Anamosa, recently received two crushers which are expected to be producing August 15. It has one crusher already installed and producing. The St. Louis *Post-Despatch* says that 20 convicts have recently been sent to the state agricultural limestone plant at Milan to work under a trained foreman. The Missouri plant was authorized by a law passed at the last session of the General Assembly.

Michigan City Hunting Gravel

W. W. BRIGDEN, superintendent of the department of public works, has spent a good share of his time recently roaming the near-by country in search of a new source of gravel for Battle Creek, but reports little success.

Remembering the time when there was an abundance of gravel available inside the city limits which could be had for nothing, Superintendent Brigden is reluctant to state that the time when the city will be forced to buy all of its gravel is very near.

Gravel for sewer and paving work is being purchased from a local concern, but even this source is showing signs of being exhausted.—*Battle Creek* (Mich.) *Inquirer-News.*

Big Oil Shale Company Formed

OREGON papers say that the Pacific Lumber and Shaleries Co. will begin work on Grizzly Peak, Jackson county, Oregon, within 60 days. The company is incorporated for $3,000,000 and is said to be fully financed.

Victor Alderson, formerly head of the Colorado School of Mines, who is recognized as a leading authority on oil shales in this country, has been acting as consulting engineer for the company.

Bucyrus-Erie Co. Formed

ANNOUNCEMENT has been made by William W. Coleman, president of the Bucyrus Co., that the stockholders of the Bucyrus Co. and the Erie Steam Shovel Co. have met and approved a plan for the union of the two properties.

This merger unites two of the oldest and best known manufacturers of shovels and other machinery and equipment for use in the rock products and contracting fields. The Bucyrus Co. has been in business for 47 years, and the Erie company, which was known for a long time as the Ball Engine Works, has been making shovels since 1914.

Crushed Stone Convention for 1928

THE directors of the National Crushed Stone Association met at Atlantic City, Friday, August 29, and decided to hold the next annual convention the third week in January at West Baden, Ind. The exact dates are not yet announced, but they will be in the week following the "Road Show," which is to be held in Cleveland, Ohio, this year.

Colorado Portland's New Plant

LATE reports are that the Colorado Portland Cement Co.'s new $2,000,000 plant, in the course of erection on the outskirts of Fort Collins, Colo., will be turning out cement in September, although the plant will not be finished until late this year.

It is stated that the plant will have a capacity of 14,000 sacks of cement daily, which will be made from the Niobrara shale near-by, the supply being almost unlimited. This shale is mixed with limestone and is said to be an ideal mix for the making of portland cement. Natural gas from the wells adjoining will be the principal fuel. To make the plant a dustless one there has been expended $150,000.

Old residents of Fort Collins recount that it was in 1872 that Charles Boettcher, the president of the Colorado Portland Cement Co., started in business in Fort Collins as a hardware merchant.

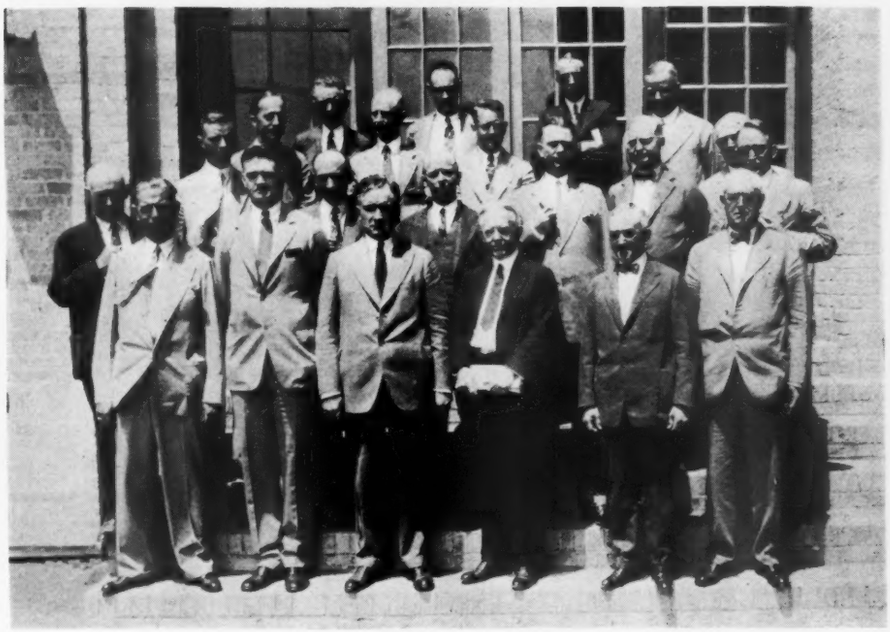
Canadian Gypsum Combination

REORGANIZATION has been effected by the shareholders of the Alabastine Co. of Paris, Ontario, at a meeting held in that town on July 20. It was decided to surrender the charter and also the charters of the subsidiary companies, the Ontario Gypsum Co., Ltd., and the Ontario Builders' Supplies, Ltd. A new company to be called the Canada Gypsum and Alabastine Co., Ltd., will be formed to take over the combined concerns mentioned above and also the business of the Nova Scotia Gypsum and Coal Co., Ltd., with gypsum deposits at Mabau, Nova Scotia. The head office of the new company will remain at Paris.

A Dominion charter has been granted the Ontario Gypsum and Alabastine Co., Ltd., with 100,000 shares of common stock of no par value.

United States Lime Products Co. Formed in Los Angeles

A NEW company, known as the United States Lime Products Co., has been formed by the merger of the Nevada Lime and Rock Corp. and the Pacific Lime and Plaster Co., according to California papers. Charles M. Cadman, president of the Pacific Lime and Plaster Co. is to be president of the new company.



Directors of National Crushed Stone Association at Atlantic City, N. J.

Both are old companies; the Nevada Lime and Rock Co. has operated kilns at Sloan, Nev., for many years, and the Pacific Lime and Plaster Co. has had a modern lime plant at Sonora, Calif., for a long time.

The new company will distribute its products all along the Pacific coast and through the mountain states. It will also market a considerable part of its production to the Hawaiian Islands, South America and the Orient.

Suit for Sand, Gravel and Shell Royalty in Louisiana

A SUIT as to who shall have the royalty collected by the state of Louisiana on sand, gravel and shell has been going on for some time, according to New Orleans papers. About $22,500 is involved and $7,000 has been transferred to the state general fund which the conservation commissioner is trying to have returned. Louisiana is one of a few states that collect a royalty or "severance tax" on the extraction of minerals.

Canada Cement Co. Buys Gypsum Properties

THE Canada Cement Co. is reported to have purchased six gypsum properties situated on the north side of Antigonish harbor, Nova Scotia. These sites were optioned last fall by H. B. McCurdy of Sydney, who sold his interests to the Canada Cement Co. The area transferred consists of about 12,000 acres with a harbor frontage of about two miles. Other sites nearby were also acquired by the company and it is stated that other options are held.

The operating plant to be installed is reported to include two miles of track, a crushing plant, a pier and a Diesel power plant. Important developments in the gypsum industry in the eastern part of Canada are expected to follow.

Ask No Tax on Heavy Trucks

A RESOLUTION calling for the Quebec Provisional Board to make the necessary efforts that owners of trucks whose loads exceed 24,000 lb. be exempted from the operation of taxes for the maintenance of roads on which they have no right of way was unanimously adopted at a meeting of the Retail Merchants Association during their recent convention in Montreal.

In the province of Quebec automobiles are taxed according to their weight, the heavier the truck or automobile the higher the tax. Trucks weighing over a certain limit are prohibited from certain streets.

If this resolution succeeds, it will mean a considerable saving for all the large quarry operators, the cement plants and crushed stone and gravel plants of the province of Quebec.

Carbolic Acid from Lime Kilns

THERE is in most lime-kiln gases a small proportion of phenol or carbolic acid which can be recovered by washing the gases with a solution of caustic soda in which the phenol is soluble, but can be precipitated by the addition of an acid. The recovery involves the loss of a considerable amount of soda, which is neutralized by the carbon dioxide as well as by the phenol, so that the process is of doubtful value, though it is used to a limited extent in Germany.—*Alfred Searle in Stone Trades Journal.*

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[32]	May 24	.....	1½	3	
Allentown Portland Cement Co. (6% bonds, 1932)[32]	May 24	.....	87	92	
Alpha Portland Cement Co. (common)[2] new stock	Aug. 1	No par	38	41	75c quar. July 15
Alpha Portland Cement Co. (preferred)[2]	Aug. 1	100	115	.....	1¾% quar. June 15
American Lime and Stone Co. (7% bonds, 1942)[32]	May 24	.....	97	101	
Arundel Corporation (sand and gravel—new stock)	Aug. 3	No par	36½	36½	50c July 1
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	July 19	.....	119	121	
Atlas Portland Cement Co. (common)[2]	Aug. 1	No par	42	44	50c qu. June 1
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Aug. 1	33⅓	43	.....	2% quar. July 1
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Aug. 2	.....	32¼	33½	75c quar. Aug. 1
Bessemer Limestone and Cement Co. (6½% bonds)[4]	Apr. 8	.....	99	100	
Boston Sand and Gravel Co. (common)	July 29	100	75	.....	1% qu., 2% ex. Jan. 1
Boston Sand and Gravel Co. (preferred)	July 15	.....	.....	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	July 15	.....	.....	90	2% quar. Jan. 1
Canada Cement Co., Ltd. (common)	Aug. 3	100	147½	148	1½% qu. July 16
Canada Cement Co., Ltd. (preferred)[11]	July 29	100	117	.....	1¾% quar. Aug. 16
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	July 29	.....	101	102	3% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	July 29	100	96	99	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Aug. 1	No par	28½	.....	50c July 11
Charles Warner Co. (preferred)	Aug. 1	100	105½	.....	1¾% quar. July 28
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	July 1	Retired at 102			
Cleveland Stone Co. (new stock)	Aug. 2	.....	60	62	50c qu. June 15
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	July 29	100	105	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Aug. 4	100	96	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Aug. 4	100	94	98	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	July 28	100	99½	101½	
Coosa Portland Cement Co. (6% bonds, 1944)[32]	May 24	.....	70	.....	
Coplay Portland Cement Co. (6% bonds, 1941)[32]	May 24	.....	88	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Aug. 4	100	99	100	
Dolese and Shepard Co. (crushed stone)[7]	Aug. 3	50	99	102	$1.50 July 1, $1 ex. July 1
Egyptian Portland Cement Co. 7% pfd.[21]	July 30	.....	85	90	1¾% quar. July 1
Egyptian Portland Cement Co. (common)[21]	July 30	.....	5	7	40c quar. Oct. 1
Fredonia Portland Cement Co. (6½% bonds, 1940)[32]	May 24	.....	97	101	
Giant Portland Cement Co. (common)[2]	Aug. 1	50	40	55	
Giant Portland Cement Co. (preferred)[28]	Aug. 1	50	40	43	3½% June 15
Ideal Cement Co. (common)	Aug. 3	No par	80	83	$1 quar., July 1
Ideal Cement Co. (preferred)[33]	July 30	100	110	112	1¾% quar. July 1
International Cement Corporation (common)	Aug. 1	No par	57½	58	$1 quar. June 30
International Cement Corporation (preferred)[2]	July 28	100	108	110	1¾% quar. June 30
Kelley Island Lime and Transport Co.	Aug. 2	100	150	.....	$2 quar. July 1
Lawrence Portland Cement Co.[2]	Aug. 1	100	100	104	2% quar.
Lehigh Portland Cement Co.[6]	Aug. 1	50	117	121	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1928 to 1931)[13]	July 29	100	99	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1932 to 1935)[13]	July 29	100	98	99	
Marblehead Lime Co. (1st Mort. 7's)[14]	July 29	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	July 29	100	98	.....	
Michigan Limestone and Chemical Co. (common)[6]	Aug. 1	.....	26	28	
Michigan Limestone and Chemical Co. (preferred)[6]	Aug. 1	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Aug. 3	25	40	40½	50c Aug. 1
Monolith Portland Cement Co. (common)[9]	July 28	.....	12¼	12⅝	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	July 28	.....	30¾	31⅞	
Monolith Portland Cement Co. (preferred)[9]	July 28	.....	9¼	9⅝	
National Gypsum Co. (common)[25]	Aug. 3	.....	52	54	
National Gypsum Co. (preferred)[25]	July 19	.....	85	88	
Nazareth Cement Co.[20]	July 29	No par	32	34	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	July 29	.....	110	115	
Newaygo Portland Cement Co. (6½% bonds, 1938)[32]	May 24	.....	100	102	
New England Lime Co. (Series A, preferred)[14]	July 29	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Aug. 1	100	95	97	
New England Lime Co. (V.T.C.)[22]	Aug. 1	.....	33	36	
New England Lime Co. (6s, 1935)[14]	July 29	100	99	101	
New York Trap Rock Corp. (6% bonds, 1946)[32]	Aug. 1	.....	100½	100⅝	
North American Cement Corp. 6½s 1940 (with warrants)	Aug. 1	100	83½	84½	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[32]	July 14	.....	60	65	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Apr. 9	.....	8⅛	9	
North American Cement Corp. (preferred)	Apr. 25	.....	.....	.....	1.75 quar. Aug. 1
North Shore Material Co. (1st Mort. 6's)[15]	Aug. 4	100	98½	100	
Pacific Portland Cement Co., Consolidated[5]	July 28	100	61	.....	25c mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	July 28	100	97¼	.....	3% semi-annual Oct. 15
Peerless Portland Cement Co.[3]	July 28	10	4	4¼	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Aug. 1	100	99	99⅛	
Pennsylvania-Dixie Cement Corp. (preferred)[29]	July 19	100	95	.....	1¾% Sept. 15
Pennsylvania-Dixie Cement Corp. (common)[29]	Aug. 3	.....	28	28¼	80c July 1
Petoskey Portland Cement Co.[1]	Aug. 3	10	10½	11¼	1½% quar.
Pittsfield Lime and Stone Co.[31]	Apr. 26	.....	.....	100	
Pittsfield Lime and Stone Co.[31] (common)	Feb. 25	.....	.....	25	

(CONTINUED ON PAGE 80)

[1]Quotations by Watling,Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York.

Editorial Comment

Overproduction in Sand and Gravel

In the recent mid-year meeting of the National Sand and Gravel Association and in the still more recent meeting of the Missouri Valley producers, overproduction was the topic discussed with most interest. The section affected includes the states of Illinois, Kansas, Missouri and Oklahoma and parts of adjoining states. Illinois producers through the state association have asked railroad companies to discourage further investment in plants on their lines, and the Missouri Valley Association has a committee which will address not only railroads but banks and financial houses, showing that the industry is already overplanted and further investment of capital would be unwise.

The situation is not entirely new. In the states mentioned there have been more sand plants than were really needed to supply the market the greater part of the time. Conditions are worse just now because road programs are being completed, some of the principal towns have been overbuilt, and the agricultural situation is even worse than it has been. High water, heavy rains and a late season have delayed construction, and stopped it altogether in some cases.

Combination has helped matters in some localities. In Kansas a strong company was formed last year which took over 20 sand plants and shut down those not needed. A combination of quarries in the Kansas City district (where there is almost no production of gravel) has taken over 17 quarries and intends to shut down all but seven. By reducing duplication of effort and cutting overhead, such combinations are able to earn something on the capital invested, even in a bad market. But this is a method of relief which cannot be generally applied, and the greater number of producers are standing pat, endeavoring to keep organizations intact, doing what business there is to be done, and hoping for amelioration.

At both meetings referred to, the National Sand and Gravel Association, trade papers in general and Rock Products in particular, were asked to do what they could to relieve the situation. So far as Rock Products is concerned, it has always warned editorially against the investment of new capital in districts which had sufficient plant capacity, not only in the sand and gravel but in the other rock products industries. Representing, as it does, the *established* industry, in its columns, and in its private correspondence with intending investors, it has always actively discouraged the entry of new producing factors in competitive localities. For two reasons; first because a new producer is likely to market a product of inferior quality and thus create an unfavorable impression of our materials, and second because the new producer, uneducated as to costs, is apt to sell at prices which, while they finally end in his own extinction, in the interim dislocate the established prices in the locality in which he operates. In truth, Rock Products has been at great pains to discourage and prevent the irresponsible producer and his inferior quality of product.

And it says that in the present situation there should be no more plant building except that which is needed to replace obsolete and worn-out plants, building that must be done, even in a declining market, if a concern is to stay in business. Beyond this, and giving full publicity to the facts, there is not much that a trade paper can do. But sitting on the sidelines, it may see some things not visible to the man in the thick of the game.

One of these is that there is some prospect of improvement. In Illinois the gas tax (provided it survives the attack just made on it in the courts) will speed up the state road program and call for a lot of county road building. In Kansas the use of "sandgravel" in concrete roads will give an added market, and while this may seem to hurt the coarse aggregate market, it will not really do so, as such material would hardly be used where coarse aggregate was readily obtainable. And a little further in the future there is the determined effort now being made to build up this part of the Middle West industrially. Most important of all is that many construction projects have not been abandoned; they have merely been delayed until another year.

And while it is not pleasant to advocate a policy of retrenchment, it is only fair to point out that the present market calls for as much material as the market of a few years ago, when most of the producers were making money. One trouble with the overproduced area is that there was a greatly increased demand from 1923 to 1925. Highway programs were going strong and general construction was increasing. This was not true of all parts, but it was true in many parts of the states affected. In some instances expansion was undoubtedly carried beyond the normal requirements and there is no way to meet the situation except by retrenchment.

The most hopeful aspect of the situation is the way it is being met by the producers. Not so many years ago a period of overproduction was often climaxed by a battle royal which ended in a lot of failures with unpaid debts that usually affected outside industries enough to cause other failures. But now we have a frank admission of the situation, open discussion, and an honest effort to prevent it from getting any worse and, if possible, to find some way to make it better.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Riverside Portland Cement Co.	May 9	.....	165	.....	
Rockland and Rockport Lime Corp. (1st preferred)[34]	Aug. 1	100	101	.....	3½% semi-annual Aug. 1
Rockland and Rockport Lime Corp. (2nd preferred)[34]	Aug. 1	100	60	.....	3% semi-annual Aug. 1
Rockland and Rockport Lime Corp. (common)[34]	Aug. 1	No par	.....	55	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Aug. 2	100	125	135	$2 qu. July 1
Santa Cruz Portland Cement Co. (bonds)[8]	July 15	.....	105	.....	6% annual
Santa Cruz Portland Cement Co. (common)[8]	July 15	.....	85	.....	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	July 16	.....	26	26⅜	
Schumacher Wallboard Corp. (preferred)	July 16	.....	26	.....	
Southwestern Portland Cement Co. (units)	May 11	.....	205	.....	
Superior Portland Cement, Inc. (Class A)[30]	July 28	.....	45	45¼	
Superior Portland Cement, Inc. (Class B)[30]	July 28	.....	23½	24½	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	July 14	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	July 14	100	98	100	
United States Gypsum Co. (common)	Aug. 3	20	90¼	91	40c quar. June 30
United States Gypsum Co. (preferred)	Aug. 3	100	123	123	1¾% quar. June 30
Universal Gypsum Co. (common)[3]	July 18	No par	.....	6	
Universal Gypsum V.T.C.[3]	July 19	No par	4	5½	
Universal Gypsum Co. (preferred)[3]	Nov. 23	.....	73	77	1½% Feb. 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	July 19	100	.....	96	
Union Rock Co. (7% serial gold bonds)[18]	July 28	.....	99	101	
Upper Hudson Stone Co. (1st 6's, 1951)[32]	May 24	.....	93	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[32]	May 24	.....	104	.....	
Vulcanite Portland Cement Co. (7½% bonds, 1943)[32]	May 24	100	98½	101	
Whitehall Cement Mfg. Co. (common)[36]	July 29	.....	98	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	Aug. 4	100	99	.....	
Wolverine Portland Cement Co.	Aug. 3	10	6¾	7½	15c quar. Aug. 15
Yosemite Portland Cement Co.	May 11	.....	7½	.....	

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Asbestos Corp. of Amer. (5 sh. pfd. and 5 sh. com.)[1]	June 22	.....	$1 for the lot		
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Blue Stone Quarry (60 shares)[2]	Mar. 16	.....	$10¼ for the lot	.....	
Coplay Cement Mfg. Co. (common) [1]	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) [1]	Dec. 30	.....	70	.....	
Eastern Brick Corp. (7% cu. pfd.) [1]	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) [1]	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)[4]	Sept. 11	50	20c	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phosphate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand and Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) [1]	Mar. 17	.....	$12 for the lot	.....	
Knickerbocker Lime Co.x	June 22	.....	100	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¼	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1¼	
Phosphate Mining Co. [1]	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) [1]	June 23	.....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)[2]	Aug. 31	.....	90	.....	
Simbroco Stone Co.[2]	Apr. 20	.....	12	12	
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. [5]	Nov. 3	.....	$1 for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) [5]	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. [1] Price obtained at auction by Adrian H. Muller & Sons, New York. [2] Price obtained at auction by R. L. Day and Co., Boston. [3] Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. [4] Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. [5] Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [6] Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

South Dakota Cement Plant

OPERATIONS at the South Dakota state cement plant for the first six months of 1927 netted a bookkeeping profit of $23,462.33, according to an audit just completed by the division of audits and accounts.

The apparent profit does not include $51,350 paid out from the state general fund as interest on cement plant bonds, but includes all charges for depreciation and depletion reserves. Had the interest payments been charged as an expense it would have shown an operating loss of $27,887.67.

Gross sales during the six months, the audit shows, amounted to $433,857.91. The cost of manufacturing is set at $193,819.82; sales cost at $16,594.98, general administration expense at $5,629.51, and miscellaneous charges at $6,353.10. Miscellaneous income credits are placed at $921.12.

Present assets and liabilities of the plant are placed at $2,455,902.85 by the plant balance sheet which shows a bookkeeping surplus of $180,507.28 built up during the 2½ years of the plant's operation. This does not include the $256,750 in interest that has been paid out of the state general fund on cement plant bonds.

The assets listed include cash and accounts receivable, $289,468.48; stock inventories, $323,163.22; real estate and machinery with a depreciated value of $1,732,026.63; deferred assets, $45,830.85, and claims against closed banks of $3,965.77.

These liabilities include current liabilities of $68,500.79; appropriation, bond issue and accrued bond interest, $2,206,894.98, and surplus of $180,507.28. The current liabilities mentioned above include $52,163.30 in accounts payable.—*Sioux Falls* (S. D.) *Argus-Leader.*

Yosemite Portland in Production

THE new cement mill of the Yosemite Portland Cement Corp., Merced, Calif., is reported to have started production on July 24, the last and finishing touches having been completed a short time previously. The capacity is given at about 2700 bbl. per day.

The new mill was financed and built by money raised from stock sales to residents of the San Joaquin valley. The entire issue of stocks is reported to have been sold and of the 1400 investors about 1000 are valley residents. The authorized capital of the company is $3,500,000, divided into $2,000,000 class A common stock and $1,500,000 class B common. The class A carries an 8% cumulative dividend and is entitled to 30% of all dividends in excess of the 8% requirement. The class B is entitled to 70% of all dividends in excess of the 8% requirement of the class A stock. The par value of the stock is $10 a share.

The class A stock only has been placed on the market, class B stock going to the organizers of the company. After a reasonable time it is expected that the class A stock will be offered for listing on San Francisco and Los Angeles Stock Exchanges. At the present, there have been some sales made on an "over the counter" basis in several Los Angeles brokerage houses.

All obligations of the company have been paid, and, in addition to the investment in plant and equipment, the company has an operating capital of approximately $250,000. The investment includes the plant near Merced on 145 acres of ground, 500 acres of proven limestone rock on the Merced river with quarrying equipment and 640 acres of clay near Ione, in Amador county, where machinery has also been installed.

The head office of the company is in Fresno, with branches in San Francisco and Merced.—*San Francisco* (Calif.) *Examiner.*

North American Cement Corp. Second Quarter Report

THE North American Cement Corp., Albany, N. Y., for the six months ended June 30, 1927, reports net income after depreciation and depletion of $242,312 available for interest, federal income taxes, etc. As of July 1 the corporation held unfilled contracts in the aggregate exceeding total shipments for the first six months, and it is estimated that in the last half of the year shipments will greatly exceed those made during the first six months.

Bessemer Limestone and Cement Orders Second Dividend

BESSEMER Limestone and Cement Co. has declared the regular quarterly dividend of 75 cents a share on the "A" common stock, payable August 1 to stock of record July 20. The present company was organized last winter by Standard Slag Co. interests.

Directors of the company were told by President L. A. Beeghly that despite adverse weather conditions sales of cement are slightly ahead of those of last year and gaining rapidly. Business generally was described as satisfactory.

The plant at Bessemer is working at capacity, producing cement at a slightly higher daily rate than a year ago.

The new plant of the affiliated Federal Portland Cement Co. at Buffalo, N. Y., which began operations June 1, is working satisfactorily. Despite the usual adjustments necessary in new plants, production in June was up to 70%, Mr. Beeghly said.—*Youngstown* (Ohio) *Vindicator.*

Two Great British Cement Companies

AT the close of the 19th century cement manufacture in England was mostly in the hands of small companies operating primitive plants in the Thames and Medway valleys, but competition from America, where mass production methods had been introduced, then made reorganization advisable. In 1900, thirty firms merged to form the Associated Portland Cement Manufacturers, Ltd., so collecting capital for the erection of new and expensive plants. Unfortunately, prices paid to bring about the merger were excessive. They were based on the profits of the boom year 1899-1900, and were probably too high by at least a quarter. This initial overcapitalization has hindered the company in its progress, its evil effects being accentuated by the acute depression that followed the merger. Further, after the amalgamation it was discovered that the combine had no effective monopoly of production in England. Until 1912 competition remained severe, but in that year the combine bought up 33 of its rivals and merged them into a new company, called British Portland Cement Manufacturers, Ltd., in which it took and has maintained a controlling interest, holding about 70% of the ordinary shares.

Since 1912 the two companies have made further acquisitions, but many of their improvements in their larger plants have entailed the abandonment or closing down of their smaller factories. Their present productive capacity is calculated at 2,400,000 tons (15,000,000 bbl.) per year, or rather less than 70% of the total capacity of the cement industry.

In 1918, 90% of the cement trade of Great Britain agreed to form the Cement Makers' Federation with the object of controlling prices and cutting down useless competition. The Federation fixes prices by areas, and as one of its rules is that each of the 26 companies should have one vote, the Associated Portland Cement Co., though it produces far more than its colleagues, is unable to control the sales policy (having with its subsidiaries only eight votes); in 1920 the Associated and British Portland Cement companies joined to create the Cement Marketing Co., which handles the distribution and sale of their products. Both Associated Portland Cement Co. and the British Portland Cement Co. trade abroad, but the mass of the foreign trade is in the hands of the older company, which has interests in Vancouver, controls the Colteca Co. in Mexico, and with the British Portland Cement Co. owns the Sone Valley Cement Co. of India. The companies share a controlling interest in a cement firm in Natal, and the Associated Portland Cement Co. contemplates opening a factory of some newly acquired land near Port Elizabeth in Cape Colony. Besides cement, the British Portland Cement Co. manufactures lime; the Associated Portland Cement Co., whiting. But the bulk of their trade is in cement.—*Quarry and Surveyors and Contractors Journal.*

Overcharge Refund Ordered on Sand and Gravel Rates in Chicago District

EXAMINER F. L. SHARP, in No. 16747, George W. Pyott Sand and Gravel Co. et al. vs. Atchison, Topeka and Santa Fe et al., said the commission should find not unreasonable the rates charged on sand and gravel from and to points on the Chicago and North-Western and Chicago, Milwaukee and St. Paul to and from points in the Chicago district, but inapplicable in certain instances. He said it should direct the refund of overcharges and hold the record open for 90 days for such further action as might be necessary after the parties had made an effort to agree upon Rule V data.

The case was one of tariff interpretation with alternative contentions involving the Sligo Iron Store rule in connection with the Jones rule for making combinations as to the reasonableness of the rates. The examiner said there was practically no evidence in support of the allegation of unreasonableness. Complainants conceded, in effect, the examiner said, that a basis of rates different from that advanced by them was approved in Chicago Sand and Gravel Producers vs. Director-General, 64 I.C.C. 37.

The complainants raised a section 6 issue. The examiner said they relied upon the rule that when shipments were unrouted, except for the delivering line, it was the duty of the carrier to move them over the lowest rated route and to assess the charges accordingly. The carriers insisted, the examiner said, that the complainants were seeking by means of strained and distorted interpretations to defeat rates prescribed in the Gravel Producers' case.

After stating the alternative proposition, the examiner said the Interstate Commerce Commission should find the rates applied were inapplicable and resulted in overcharges to the extent they exceeded the lowest aggregate available in accordance with bases pointed out by him in his report and that the carriers should refund on shipments that moved within the statutory period.

Reparation on shipments that had moved since March 1, 1920, and reasonable rates for the future were requested. The examiner said the prayer for rates for the future was withdrawn at the hearing. The examiner said that under the statute of limitations, recovery of charges not based on overcharges was barred as to all shipments which moved prior to December 6, 1922. Overcharges, he said, might be recovered on shipments which moved subsequent to December 6, 1921.

Rates on Crushed Stone

THE commission, by division 2, in No. 17892, North American Cement Corp. vs. Western Maryland et al., mimeographed, has found the rate charged on crushed stone, from Security, Md., to Best Gate, Md., moving interstate over the Western Maryland, applicable but unreasonable. It has found the rate charged on the same commodity, from Security to Best Gate, and from Martinsburg, W. Va., to other Maryland destinations, over the Baltimore and Ohio, inapplicable and awarded reparation. It has found the present rates not unreasonable or otherwise unlawful.

The complainant alleged the rates from January 1, 1922, to November 24, 1925, were unreasonable and unlawful. The contention that the rates were unlawful, the report said, was based upon the combination rule in effect in the period and upon the commission's decision in the Sligo Iron Store case, 62 I. C. C. 643, and 73 I. C. C. 551.

The finding was that the applicable rate on the shipments over the Baltimore and Ohio was $1.10 per net ton; that the rate charged by the Western Maryland, sixth class, was applicable but unreasonable to the extent it exceeded $1.40 per net ton, the present rate. Reparation was awarded to the basis of rates of $1.10 and $1.40.

Fluorspar Needs More Protection for Industry to Live

A SUDDEN emergency cutting off imports of fluorspar would find arms manufacturers of the United States unable to produce guns on a large scale for at least a year, it was declared recently by representatives of American fluorspar miners appearing before Commissioners Marvin and Dixon of the United States Tariff Commission in support of their plea for an increase in duty under Section 315 of the Tariff Act of 1922.

The flood of foreign fluorspar has resulted in many domestic mines shutting down, it was declared by James A. Green of Cincinnati, director of the Holly Fluorspar Co. and one of the applicants for an increase in duty. "The foreigners are increasing their imports," he asserted, "and we cannot get into the Pittsburgh or Buffalo districts. Our most important gun factories are dependent on foreign fluorspar and should imports be cut off by a sudden emergency it would be more than a year before the domestic mines could get into full production." His own plants, he said, have been shut down for seven months.

Production Cost Increased

An increase in the rate of duty would not result in higher prices in the Chicago district, but would enable the domestic producers to recover some of the ground lost in eastern Pennsylvania and Maryland, the commission was told by G. H. Jones of Chicago, president and treasurer of the Hillside Fluorspar mines, and representing the committee of fluorspar producers of the Illinois-Kentucky district.

The cost of production has increased greatly since the war, Mr. Jones explained. Labor, transportation, coal and dynamite are all more expensive, hours of labor are shorter, and, most important of all, the mines no longer are shallow pits, capable of being worked at low cost, but are deep holes with galleries, requiring timberings, ventilation and pumping, while the requirements of the steel mills, the principal users, are far more particular, requiring expensive treatment before the fluorspar can be shipped.

If the tariff on fluorspar is changed, he said, classification should be on purity rather than by size, since the latter is not the determining factor, while definite chemical requirements have been set by the steel mills and other users. Eighty-five per cent or more of all metallurgical gravel fluorspar is sold on the basis of chemical analysis.

Heavy Imports Explained

Heavy imports in 1926, totaling 75,615 tons, as compared with 48,770 tons in 1925, Mr. Jones believes, were due to an anticipation of an increase in duty, and a similar situation may prevail again this year. At the present price level—around $18 per ton—his company at least cannot make a profit, because of subnormal production, he stated.

Applications for the increase in duty on which the hearings are based were filed in 1925 by James A. Green of Cincinnati and the Lundgren-Stevens Co. of Chicago. An investigation of the question was made by the Tariff Commission experts in 1926, cost data and other information being obtained covering about 90% of the domestic output of 1925. Data regarding methods of operation, wages and prices in England and Germany were secured, but cost data were not secured from the books of foreign producers, and as an evidence of foreign cost, the value at foreign plants was determined by an analysis of all invoices of fluorspar imported in 1925, and the cost of shipment to United States ports was ascertained.

Duty Increased in 1922

Under the Tariff Act of 1909, the rate of duty on fluorspar was $3 per long ton, equivalent to $2.68 per short ton. This was reduced in the Tariff Act of 1913 to $1.50 per long ton, equivalent to $1.34 per short ton, with the provision that the weight of casks or other containers should be included in the dutiable weight. In the Tariff Act of 1922, at the instance of the same group of producers, which Mr. Jones is now representing, the duty was increased to $5.60 per long ton, equivalent to $5 per short ton. At that time, Mr. Jones explained, the domestic producers could compete with the foreign product because of the fact that the fluorspar was taken by shallow pit mining and costs of production were low. That rate, however, does not now permit of such competition.

The petition of the domestic producers for an increased rate of duty is being opposed by R. E. McMath, William H. Johnstone and W. W. Robinson, representing Bethlehem Steel Corp.; F. F. Colcord, representing the United States Smelting, Refining and Mining Co.; L. J. Bucks, representing W. H. Muller and Co., and others.—*New York Journal of Commerce.*

State Cement Plant Not Wanted by Some Washingtonians

GOVERNOR HARTLEY'S project hinting at a state-owned cement factory has failed to blast or even startle the cement manufacturers of the state. In fact it has created a furore in other directions, and the cement manufacturers are only interested as taxpayers, not as competitors. The reason for this is simple. South Dakota has a state owned and managed cement factory. It has been unable to even pay the interest on the bonds by taking the entire gross revenues for this purpose. The same thing is true of every municipally owned cement plant in the nation, and there have been but three or four. The governor charges that it costs but $1.35 a barrel to manufacture cement. This quote is not controverted or denied by the manufacturers, who are selling at around $2.50 a barrel. They just call attention to the fact that the difference between $1.35 and $2.50 represents overhead, sales, freight rates, handling, and costs of administration. Washington state could easily manufacture its own cement and place it on the market for $1.35 a barrel if the people of the state will be willing to tax themselves two mills upon every dollar of taxable property in the state. Or, in other words, the state can reduce the cost of its cement about a dollar a barrel if the people of the state are willing to pay $2,000,000 a year additional in taxes. At the present time the property owners are not interested in road moneys unless they own automobiles. The autos pay the bill, not the real and personal property taxpayers. The cement plant idea will shift the burden back to the taxpayers.—*Coupeville* (Wash.) *Times.*

Baltimore Has Building Strike

A STRIKE of plasterers and masons recently tied up about $7,000,000 worth of building in the city of Baltimore, Md. It grew from one of the recurring disputes between these trades as to which should do a certain kind of work. In this case the argument was over which should set artificial marble. The Federation of Labor jurisdictional board gave the work to the plasterers, but the bricklayers did it in defiance of the order.

Quarry Foreman Crushed

W. H. PARKER, quarry foreman at the Linwood, Iowa, plant of the Dewey Portland Cement Co., was killed recently by a peculiar accident. He was winding a cable on the drum of the hoist to remove slack from the line, when the drum suddenly began to turn. He was thrown over the drum and into the wheel (or sheave) and crushed between the wheel and its framework. The accident is reported in Davenport, Iowa, papers, which further state that it had not been determined why the drum started. W. E. Martin, the foreman of the crushing plant, who was assisting in the work, was somewhat seriously injured.

W. A. Riddell Company Buys Other Companies

THE W. A. Riddell Co., Bucyrus, Ohio, announces that it has purchased the Hadfield-Penfield Steel Co., the American Clay Machinery Co. and the Era Steel Co. The president, W. A. Riddell, states in the announcement that the business of the companies purchased will be continued and developed.

Current Abstracts of Foreign Literature

Lining of Lime Kilns. The lining of a lime kiln or, more particularly, the lining of the burning zone of a lime kiln, is subject to the action of thermal, mechanical and chemical agencies. The actual temperatures of calcination vary between 1000 and 1200 deg. C., and sometimes reach 1400 deg. C. The pressure and the motion of the charge produce wear of the lining in a shaft kiln. A chemical reaction with lime is produced above a certain temperature limit, when the new products of fusion attack and destroy the lining. Therefore, the lining of the burning zone should be a strong, sound product of low porosity.

The German Association of Lime Manufacturers circulated a questionnaire and the results showed that the life of the lining was satisfactory in rotary kilns, was somewhat endangered in the shaft kilns, and was unsatisfactory in three out of five gas-fired kilns. Samples of refractories were submitted with the answers to the questionnaire. These samples, together with 50 others collected by the author (Dr. Hans Hirsch) formed the material for extensive tests.

The following properties were established: chemical composition, fire resistance, porosity or absorption, weight per unit volume, expansion when heated to a temperature of Seger cone 14, softening under compressive load, variation of expansion, wear, and resistance to lime.

By far the most important property is the resistance to lime. It was tested by using pure limestone and a dolomitic limestone containing 12.9% magnesia. The method follows:

A depression, drilled in the sample, was filled with lime (100 gm.) in powdered form and the sample heated in an industrial kiln to temperatures of Seger cone 14 and 17. The temperature was held at its maximum for a period of 5 hours. The following was observed: complete solution of the lime meal, formation of a glassy coating on the lime particles, penetration of a glassy mass and, in most favorable cases, formation of a slight, caking coat.

Considerable variation was observed among the samples. It was notable that a high silica brick with 15% alumina was better than those with higher alumina content. At about 24% to 31% alumina the lime action—and consequent deterioration—becomes particularly marked. It is still considerable at 36% alumina, and became almost negligible for higher alumina contents. Parallel tests were made with sintered magnesia, silicon carbide, silica and the natural minerals: quartz, as well as three high alumina refractories: Dynamidon, corundum refractory and natural sillimanite.

It was found that basic materials, such as magnesite and high alumina mixtures, as well as quartzy material, quartzite and silica, providing they have sufficient density, are highly resistant to lime even at high temperatures.

The chemical reactions involved take place between lime, alumina and silica. The products of reaction are characterized by low points of fusion and result in the formation of a glass. The destructive action is particularly pronounced when alumina and silica are both present and react with lime simultaneously. It is further increased by the presence of magnesia. Thus the extent of the attack was considerably more marked on specimens with dolomitic lime.

The products of reaction were studied carefully. Thin sections were prepared and examined under the microscope. Tests were made of protective coatings, which were to heighten the life of refractories. Corundum and silica were used for this purpose. Zirconium oxide was found to give good results as long as the coating was not worn by friction.

The temperature of the kiln is of utmost importance for the life of refractories, as it determines the destructive action of the lime, which sets in at temperatures above 1200 deg. C. The gas-fired kilns, which in general have higher temperatures, show greatest destruction of the lining. Quartz and silica reduce this action, and this is true of magnesite to even a greater extent. High alumina refractories of great density and strength are inferior only to the magnesite and quartz products.

The quality of the masonry, the character of joints, as well as the operation of the kiln, have considerable effect on the life of refractory linings. Best results will be obtained by co-operation of the kiln user, builder and manufacturer of refractories.—*Tonindustrie-Zeitung* (1927), **46**, 47.

Retarding the Setting of Cement by Small Admixtures of Lead Oxide. In these tests, carried out at a laboratory in Dresden by Dr. B. Garre, portland cement was mixed with lead oxide and 28% water. The mixture was tested with the Vicat needle. Neat cement had an initial set of 4 hr. 10 min. and a final set of 6 hr. 20 min. The admixture of but 0.001% PbO retarded the final set to 9½ hr. Up to 0.2% PbO the cement showed rapid hardening after about 6 hr. As the admixture approaches 0.2%, hardening becomes slower.

Cement with 0.5 and 1% PbO does not show the characteristic period of rapid hardening. After 10 hr. the needle penetrates to a depth of 20 mm. The hardening of cements with 0.52 and 1.0% PbO was observed for 50 hr. Additional weights were used on the Vicat apparatus for this purpose. Both samples showed equally uniform hardening up to 40 hr. At 40 hr. cement with 0.52% PbO hardens more rapidly than that with 1.0%. When immersed in water after 50 hr., cement with 1.0% PbO disintegrates immediately, while that with 0.52% PbO remains sound.

The author concludes that (1) Admixtures as low as 1/1000% PbO result in retarding the set of cement to a considerable extent; (2) Higher admixtures further retard the hardening; (3) Only imperfect hardening is produced when more than 1% PbO is used as admixture.—*Zement* (1927), 469.

Free Iron in Aluminous Cements. Difficulty with high alumina cements in construction placed in sea water has caused an intensive study of possible causes of disintegration. As the concrete changed color in all cases where it disintegrated, it was surmised that the trouble came from the oxidation of free iron in the cement. Studies on the cement and mixtures of free iron with the cement have shown that the disintegration could not be laid to it. A long report and discussion by members of the French-Belgian Society for Testing Materials is given in the March number of the *Revue des Materiaux de Construction*. It seemed the consensus of opinion that disintegration of high alumina cement concrete could in all cases be traced back to improper mixing and placing, including such matters as using too warm sea water for mixing and allowing the concrete to dry out before the hardening period was well begun.

Rotary Cement Kiln. A series of tubes or channels are arranged on the outside drying zone of a rotary kiln. These are in direct connection with the kiln proper; the raw cement material to be dried and combustion gases passing in opposite direction through these tubes. The increased cross-section area reduces the velocity of the flow of the combustion gases and gives more efficient heat transfer. The raw material after drying passes below to a grinding device located in the tubes and thence to the kiln for calcining. *English Patent No.* 268,868.

Decorated Asbestos-Cement Tile. A mixture of alkaline silicate, colloidal silica or silica with a metallic salt or oxide, is molded to a backing which may be asbestos-cement or other material. The tile thus formed is heated below 350 deg. F. to harden the silicate. Colors or fillers may be added if desired. *English Patent No.* 268,851.

Concrete Mixture. One part of portland cement is mixed with five parts of a special aggregate. The special aggregate comprises one part clean stone screenings and four parts clayey stone dust, the quantity of clay in the latter being just about 5% of the total aggregate. *English Patent No.* 268,633.

New England's First Agricultural Lime Conference a Success

Meeting Held at Massachusetts Agricultural College Gives Lime Manufacturers and Salesmen Insight on New England Soil Needs

UNDER the auspices of the Massachusetts Agricultural Experiment Station, Amherst, Mass., a conference of county agricultural agents and lime manufacturers' representatives was held at the State Agricultural College, Amherst, July 13. The initiative in calling the meeting was taken by Dr. A. B. Beaumont and Prof. J. P. Helyar, of the faculty of the Massachusetts Agricultural College, and the chief purpose of the meeting, or conference, was to impress lime manufacturers with the necessity of personal salesmanship in getting New England farmers to use more agricultural lime. The agricultural authorities of this section of the country have proved themselves unqualifiedly in favor of the use of agricultural lime, at this conference as well as previously, and believe that by personally soliciting orders from the farmers, the use of agricultural lime can be greatly increased in New England, to the benefit of the farmer more than anyone else. By "lime" agricultural limestone is also meant; and the Massachusetts Agricultural Experiment Station will make no recommendations as to the particular form of lime to use, other than the *most economical* form for the particular case.

A part of the work of the Massachusetts Agricultural Experiment Station is to inspect lime products used in agriculture and to determine the calcium oxide content, the magnesium oxide content, the proportion of total oxides present as carbonates (limestone), the pounds of effective oxides in one ton of the material, and the cost per 100 lb. of effective oxides on the basis of carload prices f.o.b. producing plant. These statistics and the freight rate to the farm station and the cost of haulage to the farm give the farmer a basis upon which to figure the relative economy of lime, hydrate and ground limestone of different analyses.

A Complete Program

The conference was presided over by Dr. A. B. Beaumont, and the following program gives an idea of the completeness with which the subject of lime in agriculture was covered. The paper of J. M. Deely, of the Lee Lime Corporation, Lee, Mass., is abstracted in considerable detail. Following the meeting in the college hall an inspection tour of the experiment station farm was made, so that the visitors might see with their own eyes the results of using lime for onions, forage and vegetable crops.

Program

1. Welcome—Director Willard A. Munson, Extension Service, Massachusetts Agricultural College.
2. The Relative Value of Lime Products—Dr. A. B. Beaumont, Department of Agronomy, Massachusetts Agricultural College.
3. Lime for Onions—Dr. J. P. Jones, Department of Agronomy, Massachusetts Agricultural College.
4. Lime for Forage Crops—Professor J. P. Helyar, Department of Agronomy, Massachusetts Agricultural College.
5. As the Producer Sees It—J. M. Deely, Lee Lime Corp., Lee, Mass.
6. Lime and the County Agent—Roland A. Payne, Hampshire County Extension Service.
7. Lime for Vegetable Crops—Professor R. A. Koon, Market Garden Field Station, Waltham, Mass.
8. Lime and the Fertilizer Dealer—Professor John B. Abbott, Consulting Agronomist, National Fertilizer Association, Bellows Falls, Vt.
9. Lime for Pest Control—Dr. E. B. Holland, Agricultural Experiment Station, Massachusetts Agricultural College.

Mr. Deely's paper is given as follows:

As the Producer Sees It

I was very much interested in a sign I saw the other day which read as follows: "The scientific man knows why, the practical man knows how, and the successful man knows both"; and it seems to me that it is with such an object in view that we are meeting here to hear the views of the scientific man and the practical man, with an idea of making our customer, the farmer, the successful man.

* * * * *

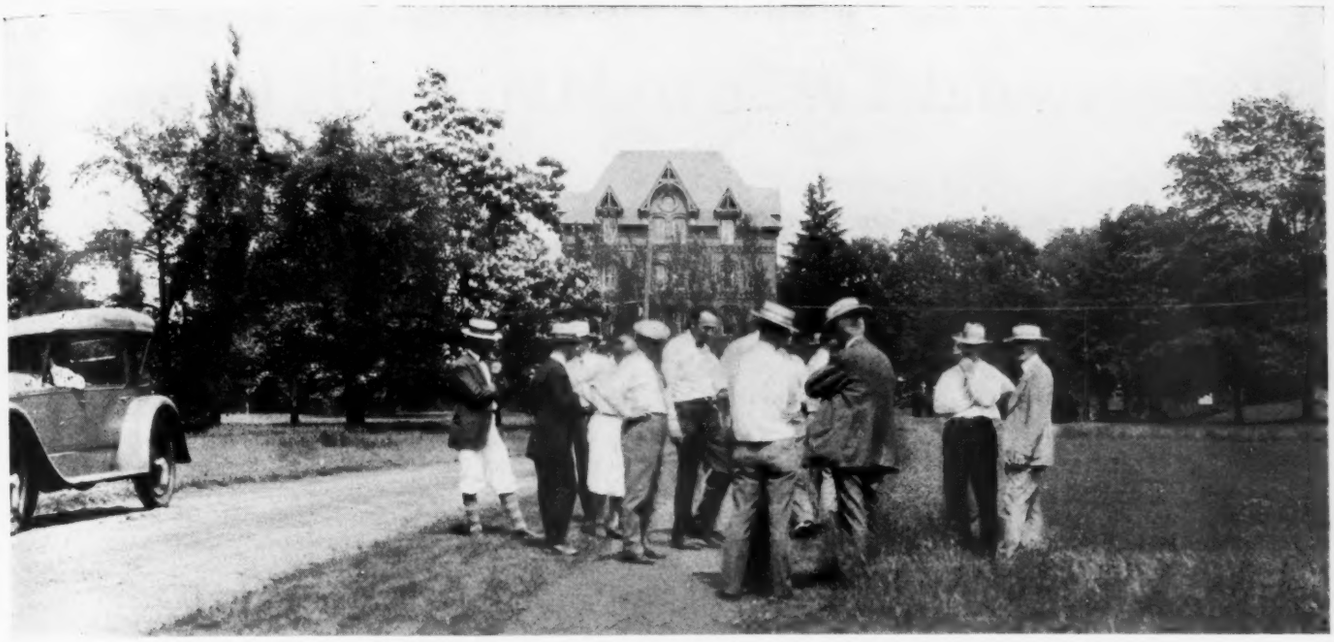
The purchaser of lime should consider the facts with reference to the kinds of materials, their properties, efficiency in the field, and factors of cost before buying. There are several market materials which are commonly used for soil liming. Liming materials vary widely in their properties, strength and efficiency in the soil. Some are concentrated in their essential constituents of calcium and magnesium and others are relatively dilute. These two constituents, commonly expressed as oxides of lime, are the all-important or active part of any liming material.

Furthermore, there is a variance in the value of liming materials, because in some materials not all the lime oxides become effective in the soil. The real worth of any material is as great as its content of available or effective oxides of lime, and it is on this basis that cost should be figured.

True cost of liming material is determined by dividing the ultimate cost per ton spread on the soil by the amount of effective oxides of lime contained in that ton. The purchaser should sum up all the items of expense incurred in getting the lime on the soil. These items are first, the initial price at the kiln or plant for the material in bulk. Second, the cost of packages or bags, and allowance for the inconvenience or extra expense of handling the material in bulk. Third, the freight bill. Fourth, the expense of the wagon haul from the station to the farm. Fifth, the cost of spreading the lime on the soil. The exact strength of the material in terms of effective oxides should be determined from the guaranteed analysis of each material offered by the seller. The true figure of cost for effective oxides is obtained by dividing the strength per ton into the total cost spread on the soil at the farm. In other words, it is not necessarily the lowest price f.o.b. plant material which is going to prove the lowest priced material delivered spread on the soil, for in fact in a great many instances the contrary is the case.

For example, consider a concentrated material that costs $8 a ton f.o.b. the plant, a freight haul of $2.75 a ton, a wagon haul of $1.70 a ton. This would give a total cost, not taking into consideration the spreading, of $12.45 a ton. Assuming in this concentrated material that the effective oxides amount to 70% or 1400 lb. in every 2000 lb. of material, this would mean a cost of 89c per 100 lb. of effective oxides delivered at the farm. Assuming that a less concentrated material costs $4.75 a ton at the plant, with a freight haul of $2.75 a ton and a wagon haul of $1.70 a ton, the total cost delivered at the farm would then be $9.20 a ton. But assuming that this more dilute material contains only 900 lb. of effective oxides per ton of material, then your cost would be $1.02 per 100 lb. of effective oxides as opposed to 89c in the more expensive but more concentrated form. In addition, there is the question of distributing over the soil.

I will grant you that in various sections my competitive figures do not give a true



Some of those who attended the agricultural limestone conference at Amherst, Mass.

basis of cost, but I do particularly ask that you do not be deceived by what seems to be lowest cost at the factory, but which in many cases proves to be a more expensive liming method when it is actually laid down on the soil.

Up to the Farmer to Figure the Cost

It is a simple matter for the farmer to get his prices from the manufacturers of the various liming materials. It is also easy for him to obtain from them the guaranteed analysis, and it is then up to him to figure how much it is going to cost him to haul the material and spread it on the soil, and divide the total cost by the effective oxides guaranteed by the manufacturer. Then he can determine for himself and decide for himself just which is the better material for him to use.

It has been found from our own experience in the marketing of liming materials that the demand has been to a much greater extent for the materials which are cheapest at the plant rather than for the materials which have been carefully prepared and are in a much finer state of division and contain a much larger amount of effective oxides per ton. I am not advocating the use of any particular form of liming material, whether it be ground limestone, the so-called agricultural lime, the by-product of the lime kilns, or the more concentrated hydrated lime, but I do ask that the farmer get the actual facts for himself and be guided by the cost per ton of effective oxides rather than by the cost f.o.b. the manufacturer's plant.

Another question that has given the manufacturers a very considerable amount of worry has been the tendency to concentrate the purchase of liming materials into a period running from the first of March to the first of May. It does so happen that this is the time when the manufacturers are the busiest in their other lines of business, in that the spring building trade has started up and it is the time of the most acute labor shortage, and this tendency to buy only during the period of those two months has developed the need of tremendous storage facilities at the individual plants and will in time affect the farmer adversely, not only from the standpoint of service on shipments but also from the standpoint of cost of liming materials. From the farmer's standpoint also he is the busiest in the spring, and if as a result of his preparation of the soil in the fall more liming could be done during that period and during the winter, when he has the time and labor available, it would be of tremendous benefit to the farmer as well as to the manufacturer. I have talked with a great many manufacturers of liming materials and they say it is almost impossible to give satisfactory and efficient service on shipments, when every single customer holds off placing his orders to the last minute and then expects that he should obtain shipment the next day. It is easy to see why there is disappointment and delay to some in receiving their shipments.

Advantage of Fall Liming

I should like to develop at this time a discussion of the great value of fall and winter liming, and I should like to develop a discussion of some method of co-operating with the manufacturers in lengthening the season in which they can make their shipments, whether it be by liming in the fall, or by taking their lime during the winter, when they are quiet, and storing it to relieve the tremendous congestion which comes to all manufacturers in the spring of the year. I should like also to develop a discussion on the subject of figuring costs, with a view of understanding one another more clearly and knowing that we are both going from the standpoint of figuring costs on the proper basis.

* * * * * * *

Registration

J. B. Abbott, Consulting Agronomist, National Fertilizer Association, Bellows Falls, Vt.; P. J. Ashe, Marble Co., North Adams, Mass: A. N. Botsford, Grangers Lime Co., West Stockbridge, Mass.; R. L. Clapp, Middlesex County Farm Bureau, Waltham, Mass.; J. M. Deely, Lee Lime Corp., Lee, Mass.; D. F. Gardner, Pownal Lime Co., Pownal, Vt.; B. K. Harris, Burton K. Harris Co., Providence, R. I.; W. A. Hopkins, Rockland-Rockport Lime Corp., Boston, Mass.; R. G. Inge, New England Lime Co., Needham, Mass.; R. A. Koon, Market Garden Field Station, Waltham, Mass.; D. J. Lawlen, Pownal Lime Co., Pownal, Vt.; Hugh J. Lee, Burton K. Harris Co., Providence, R. I.; H. Lockwood, Eastern States Farmers Exchange, Springfield, Mass.; Mr. MacDonald, American Agricultural Chemical Co., Boston, Mass.; Mr. Maier, American Agricultural Chemical Co., Boston, Mass.; R. L. Mansfield, Lee Lime Corp., Lee, Mass.; K. M. Nahikian, Brewer & Co., Worcester, Mass.; H. S. Nelson, Agricultural Instructor, Weymouth, Mass.; F. C. Norton, Rockland-Rockport Lime Corp., Rockland, Me.; R. A. Payne, County Agricultural Agent, Northampton, Mass.; Mr. Sargent, American Agricultural Chemical Co., Boston, Mass.; J. B. Smith, Experiment Station, Kingston, R. I.; A. H. Treat, Miller Lime Co., West Stockbridge, Mass.; J. K. Westburg, Eastern States Farmers Exchange, Springfield, Mass.; S. M. Kraeer, 20 Taconic St., Pittsfield, Mass.; Nathan C. Rockwood, Rock Products, Chicago, Ill.

To Hold More Conferences

On the motion of Burton K. Harris, of Providence, R. I., it was voted to make the New England Agricultural Lime Conference an annual affair, the next one to assemble in the summer of 1928 at the Rhode Island State Agricultural Experiment Station, Kingston, R. I.

International Trade in Hydraulic Cements

Report of Imports into the United States and Exports from the United States and Principal Cement Producing Countries

[The following is from a report by C. F. Stephenson, compiled in the Mineral Division of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. It was issued July 28, 1927. Tables showing United States imports by customs districts and countries receiving exports from the United States have been omitted. Exports from other countries than the United States are given by totals only. Otherwise the text, except for title page and introductions, is complete. The report has been issued as *Special Cement Bulletin,* Number One, Volume 2.—The Editors.]

THE following is an attempt to show, by means of statistics, a picture of international trade in cement. To accomplish this the statistical tables of the important exporting countries of cement have been analyzed. In all cases the barrel of 376 lb. has been used, and where possible the countries of destination are given. (It should be borne in mind that these tables are based on the statistics of the exporting nations and the amounts given do not coincide exactly with the import figures published by the importing nations. As an example, Belgian export figures showing cement exported to the United States do not coincide, for various reasons, with United States import figures from Belgium for the same period.)

Figures for the year 1913 are given in order to compare prewar trade in cement with postwar trade. It has been impossible, however, to trace the countries of destination of every barrel, as most of the foreign countries record only the chief consuming countries of their cement and record the balance as "Others." Especial pains were taken to show by countries of origin cement imports into Latin American countries, that section of the world which might be considered as the natural foreign market for American exports of this commodity.

United States (Porto Rico, Hawaii and Alaska shown as countries of destination). In 1913 the United States exported 4,489,327 bbl. of cement. Exports during 1922 were under 1,500,000 bbl. and in 1926 only a trifle over 1,250,000 bbl. In other words, the United States exported 3,224,193 fewer barrels in 1926 than in 1913. The greatest losses occurred in sales to Panama, Canada, Brazil, Porto Rico and the Dominican Republic. Practically all of the American cement exports are destined for some section of the western hemisphere.

Belgium. Belgian exports of cement have steadily increased; 1926 foreign sales were greater by 3,367,577 bbl. or 65%. Of the increase the United States market accounted for 2,172,158 bbl. Belgian exports to the Netherlands, Great Britain and Egypt were also much greater.

Sweden. Swedish exports of cement have increased steadily since 1922, 1925 sales equaling those of 1913. Although Sweden has ceased selling cement in the United States, her sales to Argentina, Brazil, Colombia and Central America are greater than ever before.

Germany. Although German exports of cement greatly fell off in the early postwar years, she is now making great strides to duplicate her prewar foreign sales. The powerful cement producers have combined and are playing a strong hand, especially in the continental markets.

The Germans have not only seriously cut

IMPORTS OF ROMAN, PORTLAND AND OTHER HYDRAULIC CEMENT BY COUNTRIES OF ORIGIN AND CUSTOMS DISTRICTS OF ENTRY FOR CURRENT YEAR

Imports—Cement	1927 Barrels	1927 Value	1926 Barrels	1926 Value	Percentage 1927 over or under 1926 Barrels	Percentage 1927 over or under 1926 Value
June	99,969	$ 201,682	335,570	$ 495,744	—70%	59.3%
Six months	975,507	1,510,422	1,983,941	3,148,522	—51%	52%

Countries of Origin / Customs Districts of Entry	First Six Months—1927 Barrels 376 lb.	First Six Months—1927 Value U.S. dollars	June—1927 Barrels 376 lb.	June—1927 Value U.S. dollars
Belgium:				
Maine and New Hampshire	27,050	41,445	.....	.....
Florida	169,072	233,836	19,172	27,993
Galveston	9,008	13,568	.....	.....
Los Angeles	6,065	8,520	.....	.....
Massachusetts	265,346	377,849	35,502	59,133
Oregon	17,426	23,710	.....	.....
Porto Rico	55,383	108,015	3,000	6,468
New York	3,200	4,360	3,000	3,973
South Carolina	8,502	13,675	.....	.....
Georgia	20,000	30,080	.....	.....
New Orleans	31,215	41,328	3	6
San Francisco	26,364	33,601	.....	.....
Washington	200	406	.....	.....
Rhode Island	31,460	42,557	14,703	19,498
Philadelphia	73,174	146,644	3,238	46,775
Sabine	5,000	10,000	.....	.....
Total	748,465	1,129,594	78,618	163,846
Denmark and Faroe Islands:				
Porto Rico	126,922	193,307	14,000	21,348
France:				
San Francisco	2,504	3,053	.....	.....
New Orleans	447	2,126	.....	.....
New York	2,957	7,481	.....	.....
Total	5,908	12,665	.....	.....
Germany:				
New Orleans	5,410	5,571	410	419
Maryland	.....	5	.....	.....
Los Angeles	200	440	200	440
Total	5,610	6,016	610	859
Norway:				
Massachusetts	5,000	8,340	.....	.....
South Carolina	6,000	7,570	.....	.....
New York	1,749	2,312	1,748	2,307
Philadelphia	5,998	7,549	.....	.....
Los Angeles	500	572	500	572
Total	19,247	26,343	2,248	2,879
United Kingdom:				
Oregon	1,000	1,898	.....	.....
Los Angeles	1,000	3,069	.....	.....
New Orleans	1,000	2,196	.....	.....
Washington	1,000	2,134	.....	.....
Massachusetts	7,332	11,867	.....	.....
Porto Rico	21,524	44,268	.....	.....
New York	2,757	7,678	.....	.....
Philadelphia	3,140	5,616	743	1,102
Maryland	500	804	.....	.....
Total	39,253	79,530	743	1,102
Canada:				
Maine and New Hampshire	70	268	.....	.....
St. Lawrence	7,275	20,437	2,750	10,165
Total	7,345	20,705	2,750	10,165
Japan, including Chosen:				
Hawaii	17,500	34,292	.....	.....
Netherlands:				
Porto Rico	4,257	6,487	.....	.....
Czechoslovakia:				
Porto Rico	1,000	1,483	1,000	1,483
Grand total	975,507	$1,510,422	99,969	$201,682

in on the Belgian trade in the Netherlands, but have succeeded in selling great quantities of cement in certain parts of Belgium itself. The Germans are also selling more cement in Latin America than ever before, their principal markets being Brazil, Argentina, Venezuela, Chile and Peru.

Great Britain. Great Britain is selling comparatively small quantities of cement in this hemisphere, but its trade to the Far East and Oceania remains firm. At conferences recently held by the British cement industry plans were promulgated toward increasing its sales abroad, especially in the Far East, Africa and Oceania. The latest information from Great Britain indicates the combination of three large British cement manufacturers involving $12,500,000 capital.

Canada. Canadian sales of cement abroad are very irregular. Its principal markets are the United States and Newfoundland, also the British possessions in Latin America. Porto Rico and Cuba, formerly good markets for Canadian cement, are now buying but little in Canada.

France. The huge postwar reconstruction campaign carried out in France stimulated the domestic cement industry. As the reconstruction work was nearing completion the British coal strike occurred, permitting French producers to find a large temporary market for their product in Great Britain. The best markets of France today are in her African possessions, although since the war she has steadily increased her sales to Argentina.

Norway before the war sold but little cement abroad, 1913 figures give her total exports as less than 37,000 bbl. During 1924 and 1925, however, she exported over 1,000,000 bbl., the United States taking about 50% during both years. In South America, Norway has also greatly increased her sales, especially in Argentina, Brazil and Central America.

Denmark. The Danish statistics, especially those pertaining to Porto Rico, do not check at all with those given by the United States Customs. (Porto Rico is a U. S. Customs District.) It is felt that a large percentage of the balance was really consigned to Porto Rico and for some reason was not so recorded.

Denmark, even before the war, had acquired a large cement trade in foreign marts. At the present time Brazil, Argentina, Porto Rico, Colombia and Venezuela consume large quantities of Danish cement. On the whole, her Latin-American trade has increased more than that of any nation's in the South American and Caribbean markets.

Ash Grove Company to Build Cement Plant in Nebraska

L. T. SUNDERLAND, president of the Ash Grove Lime and Portland Cement Co., Kansas City, Mo., informs ROCK PRODUCTS of plans for a large, modern portland cement plant at Louisville, Neb., 20 miles southwest of Omaha. The Ash Grove company at present operates lime plants at Ash Grove and Galloway, Mo., and a portland cement mill at Chanute, Kan.

L. T. Sunderland

According to Mr. Sunderland, this new plant will have an initial annual production of 750,000 bbl. and an ultimate capacity for 1,500,000 bbl. annually. It will cost more than $2,000,000 and when completed will be one of the most modern plants in the industry. It will be ready for operation within 12 or 15 months and will provide employment for more than 200 men.

The new plant will be owned and operated by a Nebraska corporation under the name Ash Grove Lime and Portland Cement Co. of Nebraska, a subsidiary of the Kansas City company. The parent company was founded in 1882 and was first known as the Ash Grove White Lime Association, being reorganized later under its present name. Mr. Sunderland joined the organization in 1909 as vice-president and manager and its great advancement has been achieved under his direction first as manager and later as president.

The properties acquired in the vicinity of Louisville include several stone quarries, which have been operated many years, and additional drilled and prospected stone lands containing raw materials sufficient for a century of capacity operation of the plant.

According to Andrew Lundteigen, chief chemist and managing engineer, under whose supervision the plans and details of the Louisville plant have been worked out, the deposits acquired by the company near Louisville are unusually well adapted to the manufacture of a superior quality of portland cement.

The plant will be built on a site overlooking the Platte river at the junction of the C. B. & Q. and Missouri Pacific railroads, offering adequate shipping facilities. Actual excavating for the plant will start early in August, although the Burlington railroad has already started grading for the rearrangement of its tracks adjacent to the plant site.

The plans of the Ash Grove company also provide for the construction of houses for employes. A wooded tract on the heights overlooking the Platte river will be laid out to conform to the best ideas of modern landscaping and comfortable residences will be built and a modern water and sewage system will be installed.

Mr. Sunderland went to Omaha in 1887 and for more than 20 years was associated with his brother, J. A. Sunderland, in the Omaha Coal, Coke and Lime Co., now Sunderland Bros. Co. Twenty years ago he entered the portland cement industry and since that time it has been his intention to establish some day a large, modern cement plant in the state of Nebraska.

Mr. Sunderland is today one of the best known manufacturers in the cement industry and for years has been a leader in improving the quality of portland cement and the methods by which it is manufactured. In 1921 he served as president of the Portland Cement Association and was re-elected for a second term in 1922. It was under his administration that the present national publicity activities of the association were conceived and inaugurated, and that the General Educational Bureau for the education of the public on portland cement and its uses was organized. He retired from the presidency in 1922 to devote his attention to his own organization, but still maintains an active interest in the work of the association and the industry as a whole.

U. S. EXPORTS OF HYDRAULIC CEMENT—JUNE, 1927

Exports—Cement	1927 Barrels	1927 Value	1926 Barrels	1926 Value	Percentage 1927 over or under 1926 Barrels	Percentage 1927 over or under 1926 Value
June	69,205	$ 237,281	80,684	$ 248,814	—14%	—5%
Six months	415,626	1,414,910	471,575	1,400,735	—12%	+1%

TOTAL EXPORTS OF CEMENT FROM OTHER COUNTRIES THAN THE UNITED STATES (IN BARRELS OF 376 LB.)

NOTE: The following table gives only the total exports from each country. It is made up of the totals from the detailed tables of exports (showing countries importing) given in the report.

Country	1913	1922	1923	1924	1925	1926
Belgium	5,199,893	4,899,393	5,576,903	6,213,381	7,749,064	8,567,460
Sweden	803,706	485,897	563,088	387,540	803,159	.....
Germany	6,622,957	2,433,449	2,214,198	2,344,099	4,587,666	5,677,377
Great Britain	4,541,333	2,292,540	3,323,956	4,140,777	3,269,403	3,269,403
Canada	215,544	401,705	439,799	138,119	928,690	*262,160
France	2,355,069	1,184,327	1,671,472	1,991,726	1,996,986	.....
Norway	36,668	527,703	642,922	1,168,075	1,020,320	.....
Denmark	1,404,310	1,493,749	1,936,025	2,081,745	1,552,957	1,940,663

*Ten months only.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended July 2	Limestone Flux Week ended July 9	Sand, Gravel and Stone Week ended July 2	Sand, Gravel and Stone Week ended July 9
Eastern	4,194	3,152	15,308	13,873
Allegheny	3,912	2,814	12,760	10,684
Pocahontas	772	626	1,545	1,152
Southern	598	546	13,143	12,725
Northwestern	1,549	1,217	10,987	8,303
Central West'rn	494	368	12,734	10,068
Southwestern	354	250	6,500	6,184
Total	11,873	8,973	72,977	62,989

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1926 AND 1927

District	Limestone Flux 1926 Period to Date July 10	Limestone Flux 1927 Period to Date July 9	Sand, Gravel and Stone 1926 Period to Date July 10	Sand, Gravel and Stone 1927 Period to Date July 9
Eastern	84,429	84,963	199,121	210,549
Allegheny	100,009	95,195	161,230	180,709
Pocahontas	12,166	11,984	20,934	20,936
Southern	18,233	14,855	311,801	313,276
Northwestern	35,316	36,506	136,108	155,932
Central West'rn	12,891	13,458	220,854	225,690
Southwestern	7,102	8,431	133,477	140,496
Total	270,146	265,392	1,183,525	1,247,588

Comparative Total Loadings 1926 and 1927

	1926	1927
Limestone flux	*270,146*	*265,392*
Sand, stone, gravel	*1,183,525*	*1,247,588*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning July 31:

SOUTHWESTERN FREIGHT BUREAU DOCKET

12619. **Gravel**, from Success, Ark., to Memphis, Tenn. To establish a rate of $1 per ton of 2000 lb. on gravel, carloads, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb. marked capacity will govern, from Success, Ark., to Memphis, Tenn. There is a prospective movement of gravel from Success, Ark., to Memphis, Tenn., providing satisfactory rate can be established which will enable shippers at Success, Ark., to compete with shippers at Amory, Miss.

12651. **Crushed stone**, from points in Texas to points in Oklahoma. To establish the following rates in cents per 100 lb. on crushed stone, carloads, minimum weight marked capacity of car, from Morris Spur and Lone Star Spur, Tex., to points in Oklahoma shown below:

	From Morris Spur, Tex.	From Lone Star Spur, Tex.		From Morris Spur, Tex.	From Lone Star Spur, Tex.
Terral	72	72	Rush Spring	110	110
Ryan	80	80	Agawam	110	110
Sugden	84	84	Ninnekah	115	115
Waurika	84	84	Chickasha	120	120
Addington	90	90	Pocasset	125	125
Comanche	95	95	Minco	125	125
Beckett	95	95	Union City	133	133
Duncan	100	100	El Reno	133	133
Marlow	105	105			

The current rates were based on the Texas Single Line Scale. Shippers call attention to the recent reductions in the Texas Scale and request that same reductions be made in the rates involved herein.

12739. **Crushed stone**, from St. Louis, Mo., and Chicago, Ill., to Tulsa, Okla. To establish proportional rate of 12½c, minimum weight 90% of marked capacity of car, plus 11c minimum weight marked capacity of car from Chicago, Ill., and 10c minimum weight 90% of marked capacity of car plus 11c minimum weight marked capacity of car from St. Louis, Mo., on crushed stone, carloads, from Tulsa, Okla. The above rates are based on Argentine, Kan., combination, and as these rates are used in constructing through rates on movement from points in Vermont, and in order for other carriers to participate, it is necessary that they be published as through rates.

12772. **Sand and gravel**, from St. Clair, Mo., to East St. Louis, Ill. To establish rate of 97c per ton of 2000, rate to apply only to industries, team track and connections of the Terminal R. R. Association of St. Louis, East St. Louis Connecting Ry. and St. Louis Merchants' Bridge Ry., located within the East St. Louis, Ill., switching district and on traffic destined beyond, on sand (except silica sand) and gravel, also crushed gravel, carloads, minimum weight 90% of marked capacity of car, but not less than 60,000 lb., except when car is loaded to full visible or space carrying capacity, in which event actual weight will govern, from St. Clair, Mo., to East St. Louis and Granite City, Ill. The proposed rate, it is stated, is based 20c per net ton over the present rate from Pacific, Mo. It is claimed it is reasonable, and St. Clair, Mo., is only 18 miles more distant than Pacific, Mo.

12775. **Crushed stone**, from Ironton, Mo., to points in Missouri. To establish the following distance scale of rates on asphalt coated crushed stone, carloads, minimum weight 90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car the actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lb. from Ironton, Mo., to points in Missouri, for intrastate application.

For distance of—	Single Line Proposed	Joint Line Proposed
20 miles and under	70	90
30 miles and over 20	75	95
40 miles and over 30	80	100
50 miles and over 40	85	105
60 miles and over 50	90	110
70 miles and over 60	95	115
80 miles and over 70	100	120
90 miles and over 80	105	125
100 miles and over 90	110	130
110 miles and over 100	115	135
120 miles and over 110	120	140
130 miles and over 120	125	145
140 miles and over 130	130	150
150 miles and over 140	135	155
160 miles and over 150	140	160
170 miles and over 160	144	164
180 miles and over 170	148	168
190 miles and over 180	152	172
200 miles and over 190	156	176
210 miles and over 200	160	180
220 miles and over 210	164	184
230 miles and over 220	168	188
240 miles and over 230	171	191
250 miles and over 240	174	194
260 miles and over 250	177	197
270 miles and over 260	180	200
280 miles and over 270	183	203
290 miles and over 280	186	206
300 miles and over 290	189	209
310 miles and over 300	192	212
320 miles and over 310	195	215
330 miles and over 320	198	218
340 miles and over 330	201	221
350 miles and over 340	204	224
360 miles and over 350	207	227
370 miles and over 360	210	230
380 miles and over 370	213	233
390 miles and over 380	216	236
400 miles and over 390	217	237
Over 400 miles	220	240

It is stated that a new plant is opening at Ironton, Mo., and it is felt that the shipper at this point is entitled to the same scale of rates as published from Webb City and Dodson, Mo.

12784. **Sand**, from points in Oklahoma to points in Arkansas. To establish a rate of 9c per 100 lb. on sand, carloads, minimum weight 90% of marked capacity of car, from Tulsa and Sand Springs, Okla., to Rogers and Bentonville, Ark. Account of the geographical location of Tulsa and Sand Springs, Okla., and mileage involved on shipments destined Gogers and Bentonville, Ark., it is felt that rates from the latter points should not exceed the present Kansas City, Mo., rate to same destinations.

12789. **Crushed stone**, from Stringtown, Okla., to St. Louis, Mo. To establish a rate of 18c per 100 lb. on asphalt coated crushed stone, carloads, minimum weight marked capacity of car, but not less than 50,000 lb., from Stringtown, Okla., to St. Louis, Mo. At present time there are no published through commodity rates on asphalt coated crushed stone from Stringtown, Okla., to St. Louis, Mo., the best basis applicable being the Class "D" rate of 67c per 100 lb., which shippers contend is too high to move the traffic.

12790. **Sand**, from Shirk, Okla., to points in Missouri. To establish a rate of 10½c per 100 lb. on sand, carloads, minimum weight 90% of marked capacity of car, from Shirk, Okla., to Wheaton and Ridgley, Mo. The present rates on sand from Shirk, Okla., to Ridgley and Wheaton, Mo., are, it is stated, too high in comparison with a 10½c rate from Kansas City, Mo., to same destinations as per S. W. L. Tariff 114C, it is therefore the desire of proponent to establish the Kansas City, Mo., rate of 10½c per 100 lb.

12798. **Crushed stone**, from Marquette, Mo., to points in Tennessee and Mississippi. To establish the following rates in cents per ton of 2000 lb. on crushed stone, carloads, minimum weight 90% of marked capacity of car, from Marquette, Mo., to points shown below. (A) in Tennessee. (B) in Mississippi:

(A)	Rate		Rate
Memphis	138	Holly Springs	138
Bellevue	138	Pott's Camp	150
Forsythe	138	Winborn	150
Capeville	138	Kera	150
(B)		Hickory Flat	150
Mineral Wells	138	Myrtle	150
Olive Branch	138	Glenfield	150
Miller	138	New Albany	150
Byhalia	138	Wallerville	150
Victoria	138	Blue Springs	150
Red Banks	138	Sherman	150
Mahon	138	Belden	150
		Tupelo	150

It is desired to establish rates from Marquette, Mo., based the same existing difference over Memphis as currently applicable from Sloan, Ark., to the same destinations.

12801. **Crushed stone**, from Iron Mountain, Mo., to points in Missouri. To establish the following distance scale of rates in cents per ton of 2000 lb. on asphalt coated crushed stone, carloads.

Minimum weight—90% of marked capacity of car, except that when actual weight of shipment loaded to full visible capacity of car, is less than 90% of marked capacity of car, the actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lb., from Iron Mountain, Mo., to points in Missouri for intrastate application.

For distance of—	Single Line	Joint Line
20 miles and under	70	90
30 miles and over 20	75	95
40 miles and over 30	80	100
50 miles and over 40	85	105
60 miles and over 50	90	110

For distance of—		Single Line	Joint Line
70 miles and over	60	95	115
80 miles and over	70	100	120
90 miles and over	80	105	125
100 miles and over	90	110	130
110 miles and over	100	115	135
120 miles and over	110	120	140
130 miles and over	120	125	145
140 miles and over	130	130	150
150 miles and over	140	135	155
160 miles and over	150	140	160
170 miles and over	160	144	164
180 miles and over	170	148	168
190 miles and over	180	152	172
200 miles and over	190	156	176
210 miles and over	200	160	180
220 miles and over	210	164	184
230 miles and over	220	168	188
240 miles and over	230	171	191
250 miles and over	240	174	194
260 miles and over	250	177	197
270 miles and over	260	180	200
280 miles and over	270	183	203
290 miles and over	280	186	206
300 miles and over	290	189	209
310 miles and over	300	192	212
320 miles and over	310	195	215
330 miles and over	320	198	218
340 miles and over	330	201	221
350 miles and over	340	204	224
360 miles and over	350	207	227
370 miles and over	360	210	230
380 miles and over	370	213	233
390 miles and over	380	216	236
400 miles and over	390	217	237
Over 400 miles		220	240

The proposed rates, it is stated, are those in effect at the present time from Webb City, Mo., which were prescribed by the Missouri Public Service Commission in Case No. 4233 dated April 7, 1925, which were also voluntarily published from Dodson, Mo., to points in Missouri.

CENTRAL FREIGHT ASSOCIATION DOCKET

16115. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, Ginger Hill and Rupel, Ind., to Wilders, Kouts, Boone Grove, Hurburt, Palmer, Winfield and Crown Point, Ind., rate of 92c, and to Griffith and Highlands, Ind., 95c per net ton. Route—Via N. Y. C. R. R., North Judson, Ind., and Erie R. R. Present rates, 6th class.

16118. To establish on **crushed stone**, in bulk, in open top cars, carloads, Centerville, O., to Byers and Jackson, O. (B. & O. R. R.), rates of 115c and 125c per net ton, respectively. Present rate, 340c per net ton.

16121. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel, carloads**, Wolcottville, Ind., to Goshen, Ind. (N. Y. C. R. R.), rate of 80c per net ton. Present rate, 82c per net ton.

16122. To establish on **sand and gravel**, carloads, Fair Oaks, O., to Salesville and Quaker City, O., rate of 80c, and to Barnesville, O., 90c per net ton. Present rate, 90c to Salesville and Quaker City, O., to 100c per net ton to Barnesville, O.

16126. To establish on **crushed stone**, carloads, White Sulphur, O., to following stations on the B. & O. R. R., Shawnee, Toboso, Nashport, Pleasant Valley, Dillon and Zanesville, O., rate of 90c per net ton. Present rate, 100c per net ton.

16130. To establish following rates on **crushed stone**, carloads, White Sulphur, O., to stations on the B. & O. R. R. (per net ton): From White Sulphur, O. (C. C. C. & St. L.), to B. & O. R. R. points in Ohio:

	Pres.	Prop.		Pres.	Prop.
Sonora	$1.40	$1.10	Cambridge	$1.40	1.10
Bridgeville	1.40	1.10	Lore City	1.40	1.20
Sandale	1.40	1.10	Quaker City	1.40	1.20
New Conc'rd	1.40	1.10	Media	1.40	1.20
Cassell	1.40	1.10	Barnesville	1.40	1.20

16133. To establish on **sand**, viz.: Blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, **and gravel**, Polk, Penn., to Charleroi, Penn., rate of 227c per net ton. Present rate, 16½c.

16137. To establish on **gravel and sand**, other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, and gravel, carloads, from Ambridge, Baden, Freedom and Rochester, Penn., to end of Grindstone branch, end of Keister branch, Bute, Bitner, Penn. Rate of 135c to Crucible, Penn. Rate of 145c per ton of 2000 lb. Present rates:

To	From (1)	(2)	(3)	(4)
End of Grindstone B., Penn.	16	17	17	17
End of Keister Br. Penn.	16	17	17	17
Crucible, Penn.	16	17	17	17
Bute, Penn.	16	17	17	17
Bitner, Penn.	16	17	17	17

(1) Ambridge, Penn., present rate. (2) Baden, Penn., present rate. (3) Freedom, Penn., present rate. (4) Rochester, Penn., present rate.

16158. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, Toledo, Ohio, to Cadillac, Mich., rate of 200c per net ton. Present rate, 210c per net ton.

16185. To establish on **gravel and sand**, other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, to Berlin, Penn., from Ambridge, Baden, Freedom, Rochester and South Heights, Penn., rate of 180c per ton of 2000 lb. Present rate:

From—		From—	
Ambridge	.22½*	Baden	.22½*
So. Heights	2.00†	Freedom	.22½*
		Rochester	.22½*

*In cents per 100 lb.
†Per ton of 2000 lb.

16186. To establish on **sand**, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, West Ellwood Junction, Penn., to Glenshaw, Penn. (via P. & L. E., New Castle Junction and B. & O.), rate of 126c per ton of 2000 lb. Present rate, 151c per ton of 2000 lb.

16187. To establish on **crushed stone**, carloads, Spore, Ohio, to Guysville, Ohio, rate of 135c per net ton. Present rate, 18½c.

16191. To establish on **crushed stone**, carloads, Findlay, Ohio, to McComb, Ohio, rate of 50c per net ton. Present rate, 60c per net ton.

16197. To establish a rate of 85c per net ton on **crushed stone** and unburnt **agricultural limestone** (in bulk, in open top cars), carloads, Bellewood, LaGrange, McCook and Thornton, Ill., to Haskells, Ind. Present rate, 95c per net ton.

16199. To establish on **crushed stone**, carloads, St. Paul, Ind., to Indiana points rates as shown in Exhibit "B" attached. Present rates, as shown in Exhibit "B" attached.

Exhibit "B"

Crushed stone—Rates per net ton. From St. Paul, Ind. To B. & O. R. R. stations in Indiana:

	Pres.	Prop.		Pres.	Prop.
Oakdale	$1.07	$0.90	Vallonia	.....	.95
Butlerville	1.07	.90	Medora	.....	.95
Nebraska	1.07	.90	Sparksville	.....	1.00
Holton	1.07	.90	Ft. Ritner	.....	1.00
Dabney*	1.07	.95	Riverdale	.....	1.05
Osgood	1.15	.95	Mitchell	.....	1.05
Delaware	1.15	.95	Lovett	.95	.90
Pierceville	1.15	.95	Commiskey	.95	.90
Milan	1.15	.95	Paris	.95	.90
Moores Hill	1.15	.95	Deputy	.95	.90
Cold Springs	1.15	.95	Blocher	.95	.90
Dillsboro	1.17	1.00	Lexington	.....	.90
Cochram	.....	1.00	Nabb	.....	.95
Aurora	.....	1.00	Marysville	.....	.95
Lawrenceb'g	.....	1.00	Otuco	.....	.95
Hayden	1.04	.90	Charlestown	.....	1.00
Fleming	1.04	.90	Watson	.....	1.05
Seymour	1.04	.90	New Albany	.....	1.05
Shields	.....	.90	Jeffersonville	.....	1.18
Brownstown	.....	.95	Louisville†	.....	1.18

*Illinois, †Kentucky.

16200. To establish on crushed stone, St. Paul, Ind., to stations on the C. C. C. & St. L. Ry in Indiana rates as follows per net ton:

	Pres. Cents	Prop. Cents			
Adamsburg	69	60	New Point	70	65
Greensburg	69	60	Batesville	75	70
			Morris	76	70

SOUTHERN FREIGHT ASSOCIATION DOCKET

35220. **Gravel**, from Camden, Tenn., to M. & O. R. R. stations in Tennessee. In lieu of 113c rate, it is proposed to establish intrastate rate of 97c per net ton on gravel, carloads (not subject to Rule 34 of Southern Classification), minimum weight as shown in Item 425 of N. C. & St. L. Ry. I. C. C. 3065A, from Camden, Tenn., to M. & O. R. R. stations, viz.: Trenton, Dyer, Rutherford, Kenton, Crockett, Rives, Bethel Springs, Selmer, Ramer and Guys, Tenn.

35310. **Sand and gravel**, from Western Ry. of Alabama sand and gravel pits to southeastern points. It is proposed to revise the rates on sand and gravel, carloads, from Montgomery, Ala., to La Grange, Ga., and establish rates found reasonable by the commission in I. C. C. Docket 13365, and to increase rates from Western Ry. of Alabama pits necessary to establish rate to La Grange of 110c per net ton. Statement of the proposed rates will be furnished upon request.

35108. **Sand, gravel**, chert, slag, etc., from, to and between points on Clinchfield R. R. It is proposed to revise the present rates on sand, gravel, chert, slag, crushed stone, rubble stone and broken stone, including ballast, from, to and between points on the Clinchfield R. R., also between points on this line, on the one hand, and points on other trunk lines in southern territory that concur on basis of the scale prescribed by the Interstate Commerce Commission in Docket 17517.

35128. **Sand and gravel**, from Georgetown, Ga., to Norfleet, Fla. Lowest combination now applies. Proposed rate on sand and gravel, in straight or mixed carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern—from Georgetown, Ga., to Norfleet, Fla., 174c per net ton, made on basis of carriers' proposed Alabama-Georgia scale, less 10% for application over trunk and short lines.

35160. **Sand and gravel**, from Gadsden, Ala., Ocoee, Tenn. Present rate, 340c per net ton. Proposed rate on sand and gravel, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight will govern, from Gadsden, Ala., to Ocoee, Tenn., 158c per net ton.

35166. **Stone**, marble or slate, broken or **crushed**, from Concord, Tenn., to Central Freight Association points. In lieu of lowest combination rates, it is proposed to establish the following through rates on stone, marble or slate, broken or crushed, carloads, minimum weight capacity of car, from Concord, Tenn. (in cents per net ton): Akron, O., 416; Detroit, Mich., 428; Erie, Penn., 517; Grand Rapids, Mich., 454; Indianapolis, Ind., 340; Niagara Falls, N. Y., 517; Springfield, O., 328; Terre Haute, Ind., 452; Wheeling, W. Va., 428; Zanesville, O., 378.

35180. **Stone, crushed**, etc., from Nashville, Tenn., to Louisville, Ky. Class "A" rate of 23½c now applies. Proposed rate on stone, broken, crushed, rubble and ballast, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity actual weight shall govern, from Nashville, Tenn., to Louisville, Ky., 8c per 100 lb. Same as results from the use of the L. & N. R. R.'s crushed stone scale for the distance of 187 miles.

35186. **Sand, gravel**, chert, etc., to, from and between stations on the M. & O. R. R. It is proposed to revise the present rates on sand, gravel, chert, slag, **crushed stone**, rubble stone and broken stone, carloads, between all points on the M. & O. R. R. in southern territory, locally and jointly, on basis of the scale prescribed by the Interstate Commerce Commission in Docket 17517, and cases decided therewith, and from points of production in Illinois to destinations in southern territory, made differently over the 17517 scale rates from the border points of destination.

35206. **Stone, crushed**, from Rostoco, Alco, Miles, Pembroke, Ripplemead, Klotz and Longcor, Va., to stations on the Columbia Branch of the N. S. R. R. Present rate, 245c per net ton. Proposed rate on stone, crushed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from the origins mentioned to: Blount, Chesson, Beasley, Basnight, Buck, Hasley, Scuppernong, Creswell, Woodley, Travis and Columbia, N. C., 205c per net ton. Made with relation to the rate of 200c per ton to main line points, viz.: Markham and Swain, N. C., and 203c to points on the Belhaven Branch, viz.: Pantego and Belhaven, N. C.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

12704. **Stone**, broken or **crushed**, carloads, minimum weight in bulk, in gondola or other open top cars, minimum weight 90% of marked capacity of car, except when cars are loaded to cubical or visible capacity actual weight will apply, from Branford (Pine Orchard Quarry), Conn., to West Boylston, Mass., $1.70 per ton of 2000 lb., via Worcester, Mass. Reason—To provide a rate same as the combination of locals.

12713. **Sand**, building, common or run of bank, carloads, minimum weight 90% of marked capacity of car, from Avon, Conn., to N. Y. N. H. & H. R. R. stations, same rates proposed for same distances as now published in N. Y. N. H. & H. R. R., I. C. C. No. F2795, on page 394, from New Haven, Conn., Walpole, Mass., etc. Reason—To meet competitive conditions and provide the shippers at Avon, Conn., with rates which will permit of an appreciable movement of the Avon sand by rail.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4090A. **Stone, crushed**, carloads (rates per net ton), to Illinois points:

From Hannibal, Mo. To—	Pres.	Prop.	From Quincy, Ill. To—	Pres.	Prop.
Decatur	250	101	Decatur	88	101
Wycles	250	101	Wycles	88	101
Harristown	250	101	Harristown	88	101
Riverton	250	101	Riverton	88	101

4104. **Crushed stone**, carloads, from Krause, Stolle and Falling Springs, Ill., to Glen Carbon, Mont., Alhambra, Mt. Olive and Litchfield, Ill., via I. C. R. R. Present rate, 86c per ton of 2000 lb.; proposed, 73c per ton of 2000 lb.

4052. **Sand and gravel**, carloads, minimum weight 90% of the marked capacity of car, except when car is loaded to full cubical or visible capacity actual weight will apply, but not less than 45,000 lb., from Shawneetown, Ill. (rates in cents per ton of 2000 lb.), to Illinois points:

To—	Pres.	Prop.	To—	Pres.	Prop.
Eldorado	101	88	Ledford	101	88
Harrisburg	101	88	Carrier Mills	101	88

New English Cement Companies

ACCORDING to the (English) *Quarry and Surveyors and Contractors Journal*, two new portland cement operations will shortly be producing in England. One, at Hope, in the Peak district, Derbyshire, is to be established by G. and T. Earle, the well-known cement manufacturers of Hull. The other is that of a new company, Portland Cement and Lime Products, Ltd. This company will manufacture lime and road materials in addition to cement. The company is said to be a very strong one and the directors names are those of men well known in financial circles and in the cement industry.

Canadian Highway Construction in 1926

DURING 1926 a total of $45,563,000 was spent on construction and maintenance of all provincial highways in Canada, according to computations made by A. W. Campbell, Dominion highway commissioner. Of this total $29,585,000 was spent on construction and the balance, $15,978,000, on maintenance of highways already constructed. The total mileage of roads involved in this aggregate expenditure was 46,824.

Older Ontario led with a total outlay of $21,170,000, of which $14,020,000 was on construction and $7,150,000 on maintenance, the total mileage involved being 15,861. Northern Ontario spent a total of $4,000,000, of which $2,400,000 was on construction, and the remainder on maintenance, the total mileage of roads being 2552. Quebec was next with a total of $6,170,000, of which $4,170,000 was spent on construction, and $2,000,000 on maintenance, the total mileage being 3858.

The other provinces' expenditures were divided as follows: Nova Scotia, $1,900,000, of which $300,000 was on construction, mileage 13,000; Saskatchewan, $3,925,000, of which $2,000,000 was for construction of rural roads, and $1,775,000 for construction of main market roads, total mileage 2400; British Columbia, $3,478,000, of which $2,000,000 was spent on construction, total mileage involved 4000; Alberta, $2,140,000, of which $1,970,000 was spent on construction, total mileage 1928; New Brunswick, $1,450,000, of which $900,000 was spent on construction, total mileage 1725; Manitoba, $1,100,000, of which $950,000 was on construction, total mileage 800; Prince Edward Island, $230,000, of which $100,000 was on construction, total mileage 700.

The total mileage of highways constructed in Canada in 1926 was 5788 and the largest mileage in any province was New Brunswick, with 850, northern Ontario with 823, Quebec with 718, Manitoba with 665, Alberta with 652, of which 273 was colonization roads; Saskatchewan with 480, British Columbia with 303, Nova Scotia with 252 and Prince Edward Island with 30 miles.

Of Quebec's total mileage constructed last year, 568 was gravel road, 100 was improved earth road, 25 waterbound macadam and 25 sand clay.

Of Ontario's road construction, 525 was gravel, 124 waterbound macadam, 73 bituminous macadam, 42 asphalt concrete and 94 cement concrete. Outside of Ontario and Quebec the preponderance of road construction was improved earth and gravel roads.

Dr. Fink to Head Research of Chicago Chemical Co.

DR. G. J. FINK, who has been in charge of research work for the National Lime Association, at its Washington office,

Dr. G. J. Fink

has been appointed head of the research department of the Chicago Chemical Co.

This company specializes in water treatment and water treatment chemicals and has a large chemical and industrial laboratory at its plant at Clearing, Ill., a suburb of Chicago. Dr. Fink's long experience with work similar to that carried on by this company should fit him peculiarly for the extensive research program which the company plans.

Plasterers' Strike Averted

A STRIKE of plasterers in New York City, which would have put about 20,000 of them out of work and seriously affected building, has been averted by the efforts of William Green, president of the American Federation of Labor. According to New York papers, the trouble grew out of one of the senseless union disputes between plasterers and cement masons affiliated with the bricklayers' organization.

Florida Portland Almost Ready

THE Florida Portland Cement Co.'s plant at Hooker's Point, Fla., is almost ready to begin production, according to an article in the *Tampa* (Fla.) *Tribune*, which estimates the electrical work 90% complete, the kilns ready to line, the 800-ft. clay rock and coal storage about ready, and work progressing rapidly in other parts.

At the quarry, the same paper says, $200,000 have been spent. A railroad to the plant, 4⅛ miles long, has been constructed and two cars of dynamite have been used in developing a long face 30 ft. high.

Does Not Pay to Grind Rock Phosphate Too Fine

EXPERIMENTS on commercial Tennessee raw rock phosphate fertilizer, made at the Indiana Experiment Station, tend to show that it does not pay to grind raw rock phosphate too fine. Reground material was only 7.7% more effective. The finest material that could be separated mechanically was only 10% more effective than the commercial phosphate. The report (noted in the Experiment Station Records of the Department of Agriculture) is printed in the *Journal of American Society of Agronomy*, 18 (1926), No. 12, pp. 1103-1107.

North Carolina Feldspar

FOR 1926, the North Carolina production of feldspar amounted to about 44% of the total of the United States, with Maine coming second with 16%. In 1925, the production was 76,806 tons, valued at $496,563, or an increase of 18% in volume and 21% in value. The average price per ton in 1926 increased by 5% over 1925. The price per ton was $6.21 in 1925 and in 1926 was $6.59.

The ground material showed an increase of 6% in quantity and 5% in total value, the average price of the domestic material in 1925 was $16.93 and in 1926 was $16.29. The decrease in price is assigned by those who have been following the market to the keen competition among the dealers.

As a result of this competition the average price of the North Carolina spar is $6.59; the Maine spar, $9.07, and the New Hampshire spar, $8.66. In spite of the fact that the North Carolina spar was sold at $2 to $3 cheaper per ton than others, it is considered the standard by the consumers.—*Natural Resources.*

Moffat Tunnel Rock

THE excavation of the Moffat tunnel (Colorado) is stated to be about 92% complete, according to a July report. It is a conservative estimate that when completed there will have been taken out 1,000,000 yd. of rock. This will not be wasted, as it may be crushed and used for ballast along the railroad right of way.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Quick Success in Products

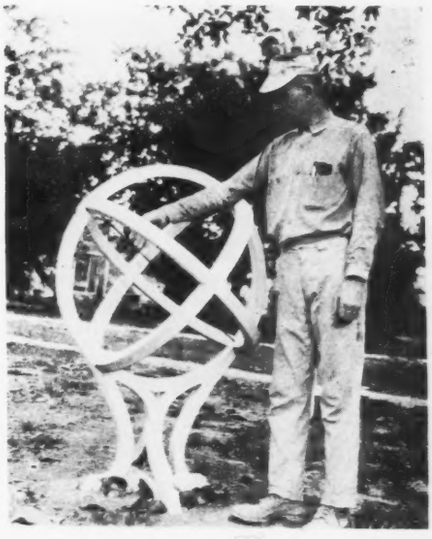
White Stone Co., Memphis, Tenn., Built to Big Business in Four Years

THE development and growth of the White Stone Co., Inc., of Memphis, Tenn., illustrates how swiftly success may come in the cement products industry to one who has the intelligence to comprehend its possibilities and the perseverance to follow them through. E. L. White, who is not only the president and manager, but by far the largest owner of the business, found himself four years ago with only $96 cash capital. He had been badly hurt financially by the fall in the prices of agricultural land, as so many were at that time. But among his assets he could count some knowledge of concrete, a good education and a well developed taste for beautiful things. And he had a firm belief that the making of concrete products offered an excellent field for the man who wanted to go into business.

His first investment was an iron wash pot which he sawed in three pieces to make a mold. With this and some bits of lumber he began molding garden vases, no two alike, and he sold $2500 worth of them the first year. He added sun-dials and some other ornaments to his line and was just getting well established in their sales when the big chance came to him.

This chance was due to the decision of the city fathers to repair the public library and build an addition. The library is a fine looking building with an exterior of red sandstone which was brought to Memphis from an eastern state. Some of it had shelled rather badly under the influence of 30 years of weathering. Stones which had to be replaced had to be matched in color, and the new addition of course had to match the old both in color and style of construction.

Mr. White went before the board in charge of the work and showed them that he could match the color and texture of the old building stone with an artificial stone of concrete. In fact, he could match it more nearly than they would be likely to match it from any quarried stone. He had a hard fight to establish his point. One of the architects was particularly opposed to concrete on the ground that it was an "architectural lie." Mr. White asked him what he called the turned wooden pillars, intended to represent marble, on a residence which he (the architect) was then building. The architect's objection was withdrawn.



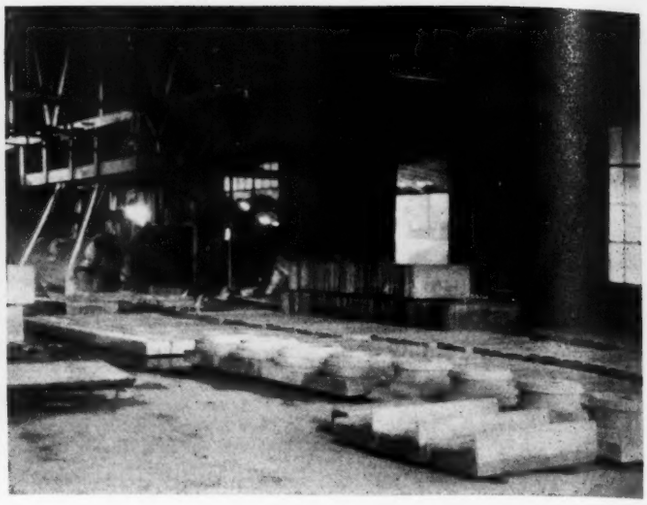
E. L. White and one of his sun-dials

For this job Mr. White invented a method which would give an actual broken stone face, like that of a stone taken from a quarry. He first filled the mold with a backing of ordinary concrete. Then he put in a layer of red concrete made to match the sandstone in color and texture. When the concrete had hardened he broke through the red layer, leaving a face which was the same as that a rough block of sandstone would have. To bring the break in the right place he ran a V-shaped strip around the inside

Office of White Stone Co.

End of curing rooms

Trimstone mixing department



Trimstone cast in gang molds

of the mold, thus forming a plane of weakness where the break would come. A chisel and a hammer split the block easily on this plane.

The building was made of what are called "random ashlars," meaning that the stones are of different widths and not evenly spaced in the wall. Mr. White made molds for ashlars of various widths, from 3 in. to 12 in., and cast a whole line of these at one time. All the work was done in a basement near the library. When this job was completed Mr. White found that he had made his reputation as a products man and he began to build up the business which is now one of the largest in its line in Tennessee.

The business is divided into two parts, the making of trimstone, architectural ornaments and garden furniture, and the making of concrete tile for straight construction work. It is all housed in a very neat building of unfaced concrete tile trimmed with white. The building stands behind his residence, which is in one of the good residential quarters of the city, and it does not look out of place among the fine homes. There are neat grounds with flower beds and shade trees all around it, and the necessary but unsightly piles of molds and the like, which might offend, are screened so that they cannot be seen from the street. His home is a handsome one made of his own tile and finished with Oriental stucco inside and out. It is in the Spanish style with twisted Moorish columns which were made at the plant.

The tile department contains two Anchor "Hightest" tile machine, a Blystone mixer and a Kent continuous mixer. They are in a room 70x125 ft. and arranged in a way that is more or less standard. Aggregate is bought from regular dealers.

Tamping the mix in plaster molds

Wolf river sand and pea gravel and fine sizes of crushed limestone are used. The latter is the preferred aggregate for making trimstone and the like. The aggregate is stored in bins in a long shed, 20x125 ft. This shed is beside the railroad sidetrack that serves the plant, and cars are unloaded by being set at the bin into which the contents are to go, so that the aggregate can be easily shoveled over by hand.

The casting of trimstone and ornaments is done in a room 100x105 ft. with a concrete floor and plenty of height for handling large pieces. It is well lighted and ventilated. At one end are the two ½-yd. Jaeger mixers in which the concrete is mixed for pouring. Both dry-tamp and wet mixes are used on this class of work, and sometimes a combination of the two. The dry-tamp mix gives a smoother face and the wet-tamp mix gives greater strength and uniformity, so some pieces are made with a dry-tamp face and a backing of wet mix. Finishing is by various methods. Some pieces are not finished at all, but simply cast smooth; others are acid treated, and a few are cut. But there is not much demand for the cut work.

The work is thoroughly systematized and so far as possible the molds are arranged in gangs, to cast a number of pieces at the same time. Both wooden and plaster molds are used, and they are made in a shop on one side of the casting room.

So far as possible, all curing, both of tile and trimstone, is by steam, and there are six kilns (or curing rooms) into which the pieces are run on cars. A 5-lb. pressure is carried on the boiler that lets steam into the room, and fog nozzles as well as steam, furnish moisture. Pieces are removed to the yard for air-curing after 24 hr. in the steam.

The construction of the curing rooms, which are 50 ft. long and 8 ft. wide, is somewhat unusual. The walls are of "Hightest" tile and the roof is arched

and of concrete plastered on "Hy-rib" reinforcing. It is covered with about 3 in. of cinders for insulation and then another layer of concrete, and finally tarred with a bituminous compound. There is not much loss of heat by radiation from such a curing room.

In tonnage the plant runs about evenely in tile and trimstone, including ornamental work. But of course the trimstone is of much greater value.

A specialty of this business is the making of concrete curbs for bored or artesian wells. These are in sections and placed as the well is sunk. The sand can get in through the openings in the sections but the gravel cannot, so that after the well has been pumped out a layer of gravel acts as a filter.

The office of the business is at the plant, which is at 1450 McLemore street, Memphis, Tenn.

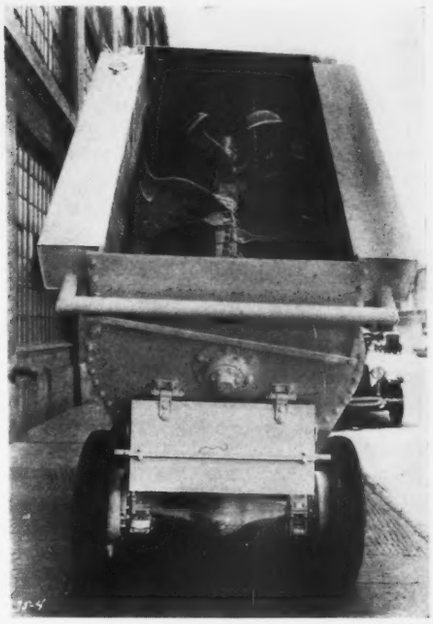
The grounds around the plant have lawns and flower beds

New Truck-Concrete Mixer Handles Crushed Stone Aggregates

THE Barrymore concrete mixer and truck combined, described in ROCK PRODUCTS, April 16, 1927, issue, pp. 102-103, is now being equipped with a new body-mixer design, which overcomes some difficulties met with in the original square cornered mixer. With the original design when a crushed stone aggregate was used there was a tendency for the material to pack in the corners and make it difficult to turn the mixer blades. In the new design, illustrated herewith, the mixer body is cylindrical with very close-fitting mixer blades, so that no difficulty is experienced in handling any aggregate.

Since the description of this device in ROCK PRODUCTS great interest has been shown by many crushed stone and gravel producers. Already fleets of these motor-truck mixers are being assembled by the principal producers in many large cities, including the Blue Diamond Co., Los Angeles; the Keystone Sand and Supply Co., Pittsburgh; the Ohio Building Material Co., Cleveland; the Missouri Portland Cement Co., St. Louis; the Consumers Material Corp., Kansas City; the Fischer Lime and Cement Co., Memphis; and others.

The mixer bodies are sold to fit on any standard, heavy-duty, motor-truck chassis. With such sales goes an exclusive contract to use the device in the localities contracted for on a royalty basis of 10 cents per cubic yard of concrete. Purchasers of these rights are contracting with other local producers to share the mixed concrete business of their localities. A. P. McCallie, owner of the Blue Diamond wet-mixed-lime mortar process (that invented by Wm. C. Hay, Los Angeles), is also the contracting agent for the Barrymore Concrete Mixer Corp. of San Francisco, with offices in the Graybar building, Grand Central Terminal, New York City.



Showing mixer blades

Truck-mixer in traveling condition

Mixer raised to pour into forms

As described in the April 16 issue of ROCK PRODUCTS, the Barrymore truck-mixer is designed to provide all the advantages of a central concrete mixing plant without any of its drawbacks, such as limited length of haul, segregation of the materials, etc. It loads with a correctly proportioned batch of aggregates and cement at the producers' bunkers, carries the necessary water for the mix in a separate tank and transports the materials dry to the site where the concrete is to be used.

Here the water is added to the scientifically measured and proportioned cement and aggregates, mixed and dumped. The whole operation requires but a few minutes, the power for operation being supplied by the truck's motor.

The device has made a strong appeal to both cement and aggregate producers, because it insures a scientifically prepared concrete for the smallest as well as the largest city job. It permits the producer of good, well proportioned aggregates to sell his materials in such a way that their good qualities are utilized instead of being spoiled in transit by segregation and mishandling.

Flexible Boards of Cement and Asbestos

BOARDS, or sheets, made of portland cement and asbestos fiber are little known in the United States, although they are manufactured here. But they are much used in Europe and in Australia, South Africa and other parts where they take the place of corrugated steel siding. The following description of this product is abstracted from an article by M. H. Guettard, printed in the *Ingenieur-Constructeur* and the *Revue des Materiaux de Construction*, both well-known French journals:

The principal production of asbestos is in the region of Quebec, in Canada, where 80% of the world's output is produced. The remainder comes from Virginia, Maryland, Pennsylvania, from Siberia in Asia and from the Cape region in South Africa. It is classified as long fiber, medium-long and wool.

The mix contains 80% to 90% cement, the remainder being asbestos. Colors may be used as with other cement products, but the natural color is a grayish tint. Blue gray, brick red and brown are found in the market.

The product while green lacks in hardness and impermeability, but gains those qualities with age. For the best results the sheets should be stored for some time in a warehouse, piled for circulation of air.

The product has the advantage that it may be sawed, drilled and nailed readily, that it is incombustible and that it does not decay. It is not affected by heat and cold and is not attacked by the ordinary acid vapors.

The old method of making cement-asbestos sheets was to mold them under pressure in flat molds. Some of the water was squeezed out, making the product of a uniform consistency. But the newer plants run the mix on a belt which passes through squeeze rolls, in the same way that gypsum wallboard is made.

The quantity of water expelled is considerable, and provision must be made for disposing of it. The ordinary method is to use a belt of absorbent material which takes up the water. The belt is then passed through pressure rolls which expel the water, leaving the belt ready to absorb more. The water extracted is pumped to a reservoir, purified and sent back to the mixing tank.

There are two methods of manufacture, one in which molding and compressing are independent processes, and the other in which they are done simultaneously.

Using the first method, the mix is made in a *broyeur-melangueur* (literally, grinder-mixer) and sent to a tank and then to an agitator where the full complement of water is added and the mix is made homogeneous. From this it is sent by a special spout to molds on an absorbent belt. The soft sheets are transferred to a powerful hydraulic press and piled with metal sheets of the form of the finished sheet between them. Pressure is continued until the sheets are of the desired thickness.

In the other method the mixture flows between two absorbent belts and then passes through squeeze rolls. These belts have chains in the interior and there are chains on the rolls, the two meshing to planes above and below, between which the sheet is formed.

To obtain rapid hardening the green sheets are sometimes treated in a steam chamber under pressure.

Tests applied to the finished product may be as follows:

Flexion: Strips 80 mm. wide cut from the sheet supported on points 200 mm. apart should support without breaking: 9 kg. if 3.5 mm. thick, 12 kg. if 4 mm. thick and 19 kg. if 5 mm. thick. Corrugated strips cut 260 mm. wide should support 45 kg. when placed on points 1.15 m. distant.

Absorption: Sheets immersed in water for eight days ought not to absorb more than 12% of their weight. Corrugated sheets under the same conditions should not absorb more than 23% of their weight.

Density: The density should be between 1900 and 2400 kg. per cubic meter.

Workability of Concrete

IN the preparation of the concrete test cylinders from 32 portland cements used in a recent investigation at the U. S. Bureau of Standards it was observed that, for the same amounts of water and cement and the same proportion and quantities of aggregate, some of the cements produced a concrete of relatively greater workability than others. Personal judgments of the relative workability of each batch were given by both of the laboratory workers who mixed the batches by hand and by the operator who rodded the concrete in the cylinder molds. Two batches were prepared from each cement on each of three different days, each of the two mixers preparing one-half of the number of batches. At the time of preparation no reference was made to the notes of preceding days, and therefore the opinions may be considered as impartial. The mixture was quite stiff, with a slump between approximately 0 and ½ in., the water cement ratio being 0.9. The mix was considerably oversanded. The flow was measured on the flow table, using 15 drops of ½ in. The following figures on nine random concretes, made from cements selected according to their general allocation by judgment into relatively dry, medium, or wet mixes, are of interest:

	Group								
	—Dry—			—Medium—			—Wet—		
Cement.....	A	B	C	D	E	F	G	H	I
Flow.....	60	61	65	73	78	68	90	85	94
Av. flow	62			73			90		

A particular point of interest is that different portland cements combined with the same proportions of identical materials, and under similar conditions, with the same ratio of water to cement will produce concretes of decidedly different workability, in so far as that property is visually apparent to the observer, by rodding the concrete or by the flow table.

The actual water-cement ratio was used without reference to any differences in the normal consistency requirements of the neat cements. An examination of the test data on the relative normal consistency did not indicate that such differences would account for the difference in workability of the concrete.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Government Specifications for Cement and Magnesia

TWO new master specifications have been recently brought out by the National Bureau of Standards. Circular No. 33, the master specification for portland cement (No. 1a) gives the required chemical and physical properties as well as prescribed test methods by which portland cement for the use of various government bureaus is purchased. The following standards are given: Loss on ignition, 4%; insoluble residue, 0.85%; sulfuric anhydride (SO_3), 2%; magnesia, 5%; residue on No. 200 sieve, 22% (by weight); initial set, Vicat needle, 45 min.; final set, within 10 hr.; tensile strength (1:3 mortar), 7-day, 225 lb./in.^{2}, and 28-day, 325 lb./in.^{2}

Circular No. 323 covers master specification 445 for cement, plastic magnesia used as flooring, bases, wainscots, etc. A method of tests through which quality is determined is given and in general the tensile and transverse strengths, expansion limits, setting times, fineness, soundness and chemical limits for the magnesium chloride solution.

Copies of these circulars are available at 10 cents each from the Government Printing Office, Washington, D. C.

Limestone Mining Methods

A MARKED tendency toward producing large tonnages of limestone by underground mining methods instead of by the old established quarrying practices is very evident in the United States, the Bureau of Mines, Department of Commerce, points out. In the course of six months' time during which the subject was investigated by the Nonmetallic Minerals Experiment Station of the Bureau, at New Brunswick, N. J., the number of underground limestone mining projects was doubled. Some of these limestone mines are quite large, the maximum daily production from a single mine being 3500 tons.

The enormous and constantly increasing demand for limestone to supply a multitude of uses is a remarkable feature of the mineral industries, states J. R. Thoenen, consulting mining engineer, Bureau of Mines, in a report on the subject. As approximately 130,000,000 tons of limestone are produced annually in the United States, it is not surprising that deposits at or near the surface are gradually being exhausted and that less advantageous supplies are being worked. Quarries are becoming deeper and wider year by year, and in many places the volume of overburden that must be removed to allow open-pit work is tremendous. Quarrymen are also gradually learning how expensive it is to clean stone from a deposit overlain by poor material.

As such conditions confront the limestone industry, the natural tendency is to seek some modification in method whereby the handicaps of increasing cost may be met and overcome. Operators, some of them unwillingly, have been forced to conclude that underground work in drifts and tunnels is the most logical solution of the problem. The unwillingness of some is largely due to unfamiliarity with mining and to the unfounded fear that costs must increase and dangers multiply with mining.

The advantages of underground limestone mining are summarized by Mr. Thoenen as:

Removal of large masses of overburden is avoided.

A mine may be operated the year round, irrespective of weather conditions, thus affording steady employment to workers and promoting contentment in the personnel and a low labor turnover.

Under certain conditions storage facilities can be provided underground more easily than on the surface and without deterioration of the product. The surplus produced when the demand is slack can be stored in anticipation of peak demands.

The clean stone produced at mines often commands a higher price than quarried stone. In fact, cleaning, at considerable expense, is often necessary to make the quarried product salable. Moreover, the limestone strata in mines are not exposed to the action of frost or water or mud washed from a clay overburden.

For fluxing, mined stone is cleaner both in lump and fine sizes than quarried stone.

A mine can be advanced to property lines regardless of such factors as extent of overburden, dip of strata, cavities, and surface conditions. Moreover, mines can be worked within city limits, where quarrying might be dangerous or be forbidden by ordinances.

The disadvantages of underground limestone mining may be thus summarized:

Some means of ventilation must be supplied to carry off fumes from explosives and furnish fresh air to workers.

There is danger from falling rock.

More fines are produced than in a quarry.

The type of labor required is more skilled, hence more expensive, than quarry labor.

Costs are in general higher than for quarries, but the difference may be counterbalanced by the higher quality of the product.

Limestone mining is a comparatively young but rapidly growing industry. Mining methods are applicable to all deposits underlying overburden that is too heavy to be removed or handled by open-pit methods. Factors that make mining possible are the presence of enough stone to warrant the expense of development, stone of a grade to satisfy market requirements as to quality and price and also strong enough to make adequate pillars. Strong roofs are requisite.

Various methods of mining adapted from coal-mine, metal-mine, and open-quarry practice are in use, as well as combinations of all three methods. The same treatment applies to the placing of drill holes. The types of equipment used underground are much like those in use at open quarries, except that churn drills cannot be used.

There does not appear to be any greater danger in limestone mining than in metal mining if work is properly planned and carefully supervised. As many quarrymen lack information on mining methods, limestone mines need more skillful men and better technical direction than quarries. Although average mining costs are higher, many individual mines operate at lower cost than many open quarries.

The choice between mine and quarry depends upon local conditions, and a decision should be made only after careful study.

Results of a comprehensive investigation of the subject of underground limestone mining are contained in Bulletin 262, copies of which may be obtained from the Bureau of Mines, Department of Commerce.

Gypsum Production in 1926

THE gypsum industry in 1926 was not quite so productive as it was in 1925, according to a statement made public by the United States Bureau of Mines, Department of Commerce, based on reports received from 59 operators in 17 states and collected in co-operation with the Geological Surveys of six producing states.

The quantity of gypsum mined in the United States in 1926 was 5,635,441 short tons, a decrease of 42,861 tons, or less than 1%, compared with 1925. This production, except for that of 1925, was the largest recorded and was twice as large as in 1916.

The total value of the gypsum sold or used by producers was $46,721,219, a decrease of $856,021, or 2%, compared with 1925. This was the largest value recorded except that in 1925. The quantity of gypsum sold by producers without calcining in 1926 was 961,363 short tons, a decrease of 52,772 tons, or 5%, and was valued at $2,509,885, or $2.61 per ton; the quantity of calcined gypsum sold or used by producers was 4,015,974 tons, a decrease of 80,383 tons, or 2%, and was valued at $44,211,334, or $11.01 per ton.

New York continues to be the largest producer of gypsum. The production of crude gypsum in that state in 1926 was 1,723,460 tons, a slight decrease from that of 1925. This was nearly one-third of the entire quantity mined in the United States and more than twice as large as that of the second state, Iowa. New York is also the largest seller of gypsum, marketing 328,086 tons without calcining, or 34% of the United States total, and 1,246,822 tons calcined, or 31% of the total. These figures represent a decrease of 7% in the uncalcined and an increase of 5% in the calcined gypsum compared with 1925. Other important states in the production of crude gypsum in 1926 were Iowa, 802,910 tons; Michigan, 659,685 tons; Texas, 533,156 tons; Ohio, 521,205 tons; Nevada, 350,972 tons, and Oklahoma, 324,021 tons. The first five of these states reported 75% of the total production.

Gypsum Mined and Uncalcined and Calcined Gypsum Sold or Used by Producers in the United States in 1926, by States

State	Number of active plants	Total quantity mined (short tons)	Sold or used by producers — Without calcining: Short tons	Value	Calcined: Short tons	Value	Total Value
Iowa	7	802,910	129,803	$ 296,854	553,498	$ 6,291,349	$ 6,588,203
Kansas	3	195,440	47,641	108,792	111,174	1,111,928	1,220,720
Michigan	5	659,685	157,787	379,848	455,616	4,641,617	5,021,465
Nevada	5	350,972	52,642	102,282	218,670	1,424,953	1,527,235
New York	11	1,723,460	328,086	905,095	1,246,822	15,889,494	16,794,589
Ohio	3	521,205	13,082	38,788	509,522	5,758,433	5,797,221
Oklahoma	3	324,021	*	*	*	*	2,301,049
Texas	5	533,156	*	*	*	*	4,126,400
Utah	3	36,333	*	*	*	*	195,535
Other states†	14	488,259	‡232,322	‡678,226	‡920,672	‡9,093,560	3,148,802
	59	5,635,441	961,363	$2,509,885	4,015,974	$44,211,334	$46,721,219

*Included under "Other States."
†Includes Arizona, California, Colorado, Montana, New Mexico, South Dakota, Virginia and Wyoming.
‡This figure includes also sales from Oklahoma, Texas and Utah.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Danbury, Conn.	2.25	2.25	2.00	1.75	1.50	.....
Dundas, Ont.	3.04	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@ .75	1.20@1.30	1.15@1.25	1.10@1.15	1.10@1.15	1.05@1.10
Munns, N. Y.	1.00	1.40	1.40	1.25	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	.....
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.75	.....	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Buffalo and Linwood, Iowa	1.10	.....	1.45	1.25	1.30	1.30
Chasco, Ill.	1.00@1.30	.....	1.00@1.15	.....	1.00@1.15	.....
Columbia, Krause, Valmeyer, Ill.	1.10@1.50	1.10@1.25	1.20@1.35	1.10@1.35	1.10@1.35	‖1.25
Flux (Valmeyer)	1.10@1.50	.....	.....	1.75	.....	1.75
Greencastle, Ind.	1.25	1.25	1.15	1.05	.75	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa	.95e	.....	1.50[1]	1.40[2]	1.30[3]	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Mt. Vernon, Ill.	1.10@1.20	1.00	1.00	1.00	1.00	.....
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75	.....	1.15	1.05	1.00	1.00
St. Vincent de Paul, Que. (A)	.....	1.35	.95	.85	.80	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Alderson, W. Va.	.40	1.45	1.35	1.25	1.20	.....
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75	.....	2.65	2.65	2.40	2.00
Cartersville, Ga.	1.50	1.65	1.65	1.40	1.25	1.25
Chico, Tex.	1.00	1.35	1.25	1.20	1.10	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	.....
Graystone, Ala.			Crusher run, screened, $1 per ton			
Kendrick and Santos, Fla.			3½ in. and less, $1 per ton			
Ladds, Ga.	.....	1.65	1.65	1.35	1.15	1.15
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	.....	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30	1.35	1.35	1.30	1.30	1.50
Sugar Creek, Mo.	1.15*	1.60†	1.60‡	1.60§	1.00¶	.....

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.25	1.75	1.55	1.35	1.25
Dwight, Calif.	1.00	1.00	1.00	.90	.90	.....
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.55	1.25	1.10	.....
New Haven, New Britain, Meriden and Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.40	1.80	1.80	1.40	1.40	1.40
Oakland and El Cerito, Calif.	1.00	1.00	1.00	.90	.90	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	1.70	2.20	2.10	1.70	1.60	1.60
Toronto, Ont.	.....	3.58@4.05	3.05@3.80	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Columbia, S. C.—Granite	.....	2.00	1.75	1.75	1.60	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.			Crushed flint rock, 2.50 per cu. yd.			
Graystone, Ala.—Granite	.50	.....	.....	.....	.....	.....
Lithonia, Ga.	.75a	1.75b	1.60	1.40	1.35	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Rochester, N. Y.			Dolomite, all sizes, $1.50 per ton			
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.—Granite	.50	1.35	1.35	1.30	1.25	1.25

*¼ to ½ in. †¼ to 1 in. ‡¼ to 1¼ in. §¼ to 2¼ in. ¶Dust.
‖Rip rap per ton. (a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2in., 1.30. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (e) Agstone to June 15, 1927. [1] ¾ to ¼ in. [2] 1 to ¼ in. [3] 1½ to ¼ in. (A) Plus 4% sales tax, less 2% discount 30 days.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	4.50
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Brandon and Middlebury, Vt.—Pulverized, burlap bags, 6.00; paper, $5.00; bulk	4.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 4½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50-mesh	1.50
Charleston, W. Va.—Marl, per ton, bulk	3.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 50 mesh, 1.75; 50% thru 100 mesh	2.25
Colton, Calif.—Analysis, 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
(Paving dust)—80% thru 200 mesh, bags	4.25@ 4.75
Bulk	3.00@ 3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.25; bulk	3.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk	2.70
80% thru 200 mesh, bags, 4.25; bulk	3.00
Ladds, Ga.—Analysis, $CaCO_3$, 64%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh	1.50@ 2.75
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.50; bags	3.00
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags	4.00
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Middlebury, Vt.—$CaCO_3$, 99.05%; 50% thru 200 mesh; sacked	5.00@ 6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio—30% thru 50 mesh	2.25
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25
Carload, 7.50; less than carload	9.00

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 95% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50
Chicago, Ill. — 50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill. — Analysis, 90% $CaCO_3$; 100% thru 4 mesh	1.10@ 1.50
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Danbury, Conn.—Analysis, 79% $CaCO_3$, 11% $MgCO_3$; 60% thru 100 mesh; 80% thru 50 mesh; 100% thru 4 mesh; bags, 4.25; bulk	3.25
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92¼ $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 100% thru 4 mesh; 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh, bags	5.00
Pixley, Mo. — Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.30

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 54% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh; bulk	*3.50
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—92% thru 100, mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

*Bags extra.

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va.	2.00@ 2.25
Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.25
Gray Summit and Klondike, Mo.	1.75@ 2.00
Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Massillon, Ohio	3.00
Mendota, Va.	2.25@ 2.50
Michigan City, Ind.	.35
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ohlton, Ohio	2.50
Pittsburgh, Penn.	3.00@ 4.00
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio		.15@ .30
Dresden, Ohio		1.00@ 1.25
Eau Claire, Wis.	4.25	.40@ 1.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.65	.65	.65	.65	.65	.65
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05	1.05	1.05
Erie, Penn.		1.00*		1.50*	1.75*	
Leeds Junction, Me.		.50	1.75		1.25	1.00c
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	1.00	.75	.75	.60	.60
Northern New Jersey	.50	.50	1.25		1.25	1.25
Portland, Me.		1.00	2.25		2.00	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.†	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Aurora, Yorkville, Sheridan, Oregon, Moronts, Ill.	.50	.40	.20	.45	.60	.55
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Barton, Wis.		.50	.75	.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio¶		.75	.75	.75	.75	
Des Moines, Iowa	.40	.40	1.40	1.40	1.40	1.40
Eau Claire, Wis.	.40	.40	.60@ .80	.90	.90	
Elkhart Lake, Wis.	.60	.40	.50	.50	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.		.50		.80	.80	.70
Hamilton, Ohio	1.00	1.00	1.00	1.00	1.00	
Hersey, Mich.		.50				.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50@ .60	.50@ .60	1.30	1.30	1.20	1.20
Mankato, Minn.				1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.40@ .50	.40@ .50	1.40	1.35	1.25	
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	1.20	1.45	1.55a	1.45	1.45	1.45
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.35	1.25	1.15
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va.	1.40	1.40	1.40	1.40	1.40	1.40
Brewster, Fla.	.45	.45	2.25			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.50				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.		.50			.90	
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.35	.35	1.25	1.00	.65	.65
WESTERN:						
Kansas City, Mo.		.70				
Los Angeles, Calif.	.40	.40	.25@1.00	.25@1.00	.25@1.00	.25@1.00
Oregon City, Ore.		1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.	1.25	1.00	2.00	1.50	1.75	1.00
Pueblo, Colo.	.70	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash. (bunkers)	1.25	1.25	1.25	1.25	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Burnside, Conn.	.75					
Chicago district, Ill.	.35					
Ferrysburg, Mich.						.65@1.00
East Hartford, Conn.	.75*					
Gainesville, Texas	1.15					.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Lindsay, Texas		1.10			.55	
Macon, Ga.	.35					
Mankato, Minn.	.30					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.					.50	
Somerset, Penn.		1.85@2.00		1.50@1.75		
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. †Rewashed.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.		2.00	2.00	2.25	1.50	1.50	3.50
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75	1.75		1.75	1.75@2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Columbus, Ohio	1.50@2.00	1.25@1.50	2.00	.30	1.75@2.00	2.75@4.50	
Dresden, Ohio	1.50@1.75	1.25@1.50	1.50@1.75	1.00@1.25			
Eau Claire & Chippewa Falls, Wis.						3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.25	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30@ .35			
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.00	1.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Ridgway, Penn.	1.50	1.50	1.75@2.00c				
Round Top, Md.				1.60		2.25	
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Potters' flint per ton, 9.00@10.00						
Thayers, Penn.	1.25	1.25		2.00			
Utica, Ill.	.55	.65		.75	.75		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.50*@2.00	1.50*@2.00	1.50*@2.00	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.50		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (g) Dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium, Erie and Dubois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*		1.45*	
Jackson, Ohio		1.05*		1.30*	1.30*	1.30*	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[23]	8.50	14.00
Lime Ridge, Penn.							5.00[2]	
Pittsburgh, Penn.	12.50	8.50	8.50		9.00	11.00	8.00	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[12]
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50	8.50	10.50	8.50	1.65[7]
CENTRAL:								
Afton, Mich.							8.40	1.35
Carey, Ohio	12.50	8.50	8.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Cold Springs and Gibsonburg, Ohio	12.50	8.50	8.50		9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio	12.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto & Marble Cliff, O.		8.50	8.50	9.50	8.25	.62½	7.50	1.50[3]
Sheboygan, Wis.	11.50				9.50		9.50	.95
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	12.50	8.50	8.50	13.50	9.00	11.00	9.00	1.50[3]
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	1.50
Graystone, Ala.	12.50	9.00		12.50			8.00	1.35
Keystone, Ala.		9.00		9.00	8.00	1.30	8.00	1.35
Knoxville, Tenn.	20.25	9.00	9.00	9.00			8.00	1.35
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.		11.00	10.00				11.00	1.40
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	19.00	19.00	14.00		16.20		12.50	2.50
Dittlinger, Tex.		12.00@13.00					9.50[8]	1.50[23]
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[30]	2.15
Tehachapi, Calif.	12.80						12.80	
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] Per 180-lb. barrel. [6] Dealers' prices, net 30 days less 25c disc. per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65. [8] To 11.00. [10] To 1.50. [12] To 3.00. [22] To 9.00. [23] To 1.60. [28] Barrels. [30] F.o.b. Woodville. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Mineral Ridge, Ohio	*1.75	*1.75
Montoursville, Penn.		1.10
Ohlton, Ohio	a1.75	a1.60
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Thayers, Penn.		2.25
Warwick, Ohio		1.50a@ 2.00
Zanesville, Ohio		2.50

*Wet. (a) Green.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons	.08
Per gross	1.00@ 1.50
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (150-200 mesh)	8.00@10.00
Pencils and steel worker's crayons, per gross	1.00@ 2.00
Chester, Vt.:	
Crude talc (Dark, 3.50; Light, 4.00)	
Ground talc (150-200 mesh), bulk	8.00@ 9.50
Including bags	9.50@10.50
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5.00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bulk	8.50@13.00
Joliet, Ill.:	
Ground talc (20-50 mesh), bags	12.00
Illinois talc, bags	12.00
California talc, bags	30.00
Southern talc, bags	20.00
Pencils and steel worker's crayons, per gross	2.50
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72%	5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
Roofing mica	30.00
Punch mica, per lb.	.12
Cut mica—50% from Standard List.	

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt. — English pink, English cream and coral pink	*11.00	*11.00
Brandon grey	*11.00	*11.00
Brighton, Tenn.— All colors and sizes	.....	§5.00
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks, f.o.b. quarries	.....	17.50
Crown Point, N. Y.— Mica spar	.....	9.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn.— Green stucco	.....	12.00@18.00
Green granite	.....	14.00@20.00
Haddam, Conn.—Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash	.....	6.00@24.00
Middlebrook, Mo.—Red	.....	20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50
Milwaukee, Wis.	.....	14.00@34.00
New York, N. Y.—Red and yellow Verona	.....	32.00
Phillipsburg, N. J.— Royal	.....	12.00@14.00
Virblend	.....	10.00@12.00
Stockton, Calif.—"Natrock" roofing grits	.....	12.00@15.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	22.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 17.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 99% thru 140-mesh	19.00
Bristol, Tenn.—Color, white; analysis, K_2O, 6 to 10%; Na_2O, 2½ to 4%; SiO_2, 68 to 78%; Fe_2O_3, 12 to 20%; Al_2O_3, 16.5 to 18.5%; 99% thru 200 mes.; bulk, depending on grade	14.50@18.00
Brunswick, Me.—Color, white; 98% thru 140 mesh, bulk	19.00
Buckingham, Que.—Color, white, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% thru 60 mesh, bags	16.00
96% thru 150 mesh, bags	28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude (bulk)	7.00
Keystone, S. D.—Prime white; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 10.20%; crude	10.05
Pulverized, 95% thru 200 mesh; bags, 22.00; bulk	20.00
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 68% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt.—Per ton	10.00
Cartersville, Ga.—(Limestone), per bag	2.00
Centerville, Iowa—(Gypsum), per ton	18.00
Chico, Texas — (Limestone), 100-lb. bags, per ton	8.00@ 9.00
Danbury, Conn.—(Limestone), bulk	6.00@ 7.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton	15.00
Gypsum, Ohio—(Gypsum), per ton	10.00
Limestone, Wash. — (Limestone), per ton	12.50
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	10.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone), bulk	‡7.50@*9.00
Wisconsin Points—(Limestone), per ton	9.00

*L.C.L. †Less than 5-ton lots. ‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00@11.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50@13.00b
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50
Detroit, Mich.	13.00@14.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.00@17.50*
Grand Rapids, Mich.	12.50
Hartford, Conn.	16.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis and St. Paul, Minn.	10.00
Minnesota Transfer	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	13.50@14.50
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75*
Saginaw, Mich.	13.50
San Antonio, Texas	16.00
Sebewaing, Mich.	12.00
Sioux Falls, S. Dak.	13.00c
South River, N. J.	14.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	12.50@16.00†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †City delivery. ¶Dealers' price. (a) Less 50c discount per M., 10 days.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.25
Birmingham, Ala.	.....	2.30
Boston, Mass.	.52¾	2.13@2.23
Buffalo, N. Y.	.55	2.20@2.30
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	.58	2.32
Cleveland, Ohio	.....	2.24
Chicago, Ill.	.51¼	2.05
Columbus, Ohio	.57¼	2.29
Concrete, Wash.	.....	2.35
Dallas, Texas	.....	2.00
Davenport, Iowa	.....	2.24
Dayton, Ohio	.58¼	2.33
Denver, Colo.	.66¼	2.65
Des Moines, Iowa	.....	2.05
Detroit, Mich.	.....	2.15
Duluth, Minn.	.....	2.04
Houston, Texas	.....	2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.	.....	2.50
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.13
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.57½	2.50
Louisville, Ky.	.55½	2.22
Memphis, Tenn.	.....	2.50
Milwaukee, Wis.	.....	2.20
Minneapolis, Minn.	.....	2.12@2.22
Montreal, Que.	.....	1 36
New Orleans, La.	.....	2.20
New York, N. Y.	.48¾	1.93@2.03
Norfolk, Va.	.....	2.07
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.22
Philadelphia, Penn.	.....	2.11@2.21
Phoenix, Ariz.	.81½	3.26
Pittsburgh, Penn.	.....	2.04
Portland, Colo.	.....	2.80
Portland, Ore.	.....	2.60*
Reno, Nev.	.....	2.91
Richmond, Va.	.....	2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.21
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.51¼	2.05
St. Paul, Minn.	.....	2.12@2.22
Seattle, Wash.	.....	2.65
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20
Topeka, Kan.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.12
Winston-Salem, N. C.	.....	2.62

NOTE—Add 40c per bbl. for bags.
*Less 10c discount.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.....	2.15
Buffington, Ind.	.....	1.80
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.35
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.90
Hudson, N. Y.	.....	1.65
Leeds, Ala.	.....	1.85
Mildred, Kan.	.....	2.35
Nazareth, Penn.	.....	1.95
Northampton, Penn.	.....	1.75
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.85
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.80

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x 36". Wt. 1500 lb. Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	.....	9.00	.....	.....	.14½	.15½	30.00
Douglas, Ariz.	.....	.....	6.00	.....	.....	.....	15.00	.....	40.00	13.50	35.00	45.00	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio	3.00	4.00	6.00	8.00	9.00	9.00	19.00	7.00	24.50	20.00	.....	15.00	30.00
Los Angeles, Calif.	.....	.....	7.50@9.50	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	11.65m	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.40	10.00	10.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	17.00c@19.00a	.....	.....
Detroit, Mich.	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00@16.00a	.....	.....
Graettinger, Iowa	.18@ .20	.....	.....
Indianapolis, Ind	.13@ .15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	16.00@18.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.20@ .25	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate. Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Grand Rapids, Mich.:	
5x8x12	8.00
5x4x12	4.50
Longview, Wash.:	Per 1000
(Stone-Tile)	
4x6x12	55.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	20.00@45.00
Mt. Pleasant, N. Y.	.....	14.00@23.00
Oak Park, Ill.	.....	37.00@42.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	18.00	25.00@40.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
Grand Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Sewer pipe (d)	.....	.....	.....	.....	.....	.63	.....	.60†	.....	.....	.....	.58	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list; culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., $18.00 per ton									
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Yakima, Wash.								$10.00 per ton									

(a) 24-in. lengths; (b) Reinforced; (d) Eastern clay, list, 72% and 60% off.
†21-in. diam. ‡Price per 2-ft. length.

Cement Bids on San Gabriel Dam in California

ONE of the largest pieces of construction proposed for the Pacific coast is the San Gabriel dam near Los Angeles, Calif. It will require 2,600,000 bbl. of cement. Bids were made on the basis of pressure strength per square inch, and according to the *Los Angeles Record* the following bids were received:

In bulk, f.o.b. mills (1200 to 2500 lb. per sq. in.), per barrel, $1.77; total, $4,602,000.
In bulk, f.o.b. mills (2500 to 3000 lb. per sq. in.), per barrel, $1.77; total, $4,602,000.
In sacks, f.o.b. mills (1200 to 2500 lb. per sq. in.), per barrel, $2.22; total, $5,772,000.
In sacks, f.o.b. mills (2500 to 3000 lb. per sq. in.), per barrel, $2.22; total, $5,772,000.
In bulk, f.o.b. Azusa (1200 to 2500 lb. per sq. in.), per barrel, $2.05½; total, $5,343,000.
In bulk, f.o.b. Azusa (2500 to 3000 lb. per sq. in.), per barrel, $2.05½; total, $5,343,000.
In sacks, f.o.b. Azusa (1200 to 2500 lb. per sq. in.), per barrel, $2.50½; total, $6,513,000.
In sacks, f.o.b. Azusa (2500 to 3000 lb. per sq. in.), per barrel, $2.50½; total, $6,513,000.

Low Cost Improvement of Roads

BULLETIN II of the National Crushed Stone Association is entitled, Low Cost Improvement of Earth Roads with Crushed Stone. It is by A. T. Goldbeck, director of the Bureau of Engineering of the association, and it treats of the use of light coats of crushed stone and screenings to improve earth roads so that they may become passable in all weathers.

Mr. Goldbeck shows the real necessity for building more of such roads which are thoroughly adapted to traffic up to 500 or 600 vehicles per day. In fact, they are among the most economical types of roads for traffic of such a density. The methods of applying stone and screenings are given in some detail and the bulletin is illustrated with photographs of the work.

Such work offers a large potential market for crushed stone products. Mr. Goldbeck estimates that there are 2,500,000 miles of road in the country which are susceptible to the treatment described.

Chemical Industries Exposition

THE Eleventh Exposition of Chemical Industries is to be opened at the Grand Central Palace, New York, September 26.

Selection of Electric Motor Controls

A Companion Article to That in Rock Products, April 30, 1927, on the Selection of Electric Motors

By H. L. Smith
Industrial Engineering Department, General Electric Co.

THE advantages of electric motor drive for industrial machinery are, in general, well understood and the rapid supplanting of other kinds of power units is a matter of record. As soon as reasonably well-designed motors were available, their advantages over other kinds of drive were easily demonstrated. One particularly important factor was the ease with which the motor could be controlled. This, with other advantages, influenced the early introduction of motors to drive line shafting, replacing steam engines, ropes, belts, etc., and has become the prime consideration in the application of the electric motor to the individual drive of industrial machines.

Much of this evolution can be attributed to the improvements made in the characteristics of the so-called "general purpose" motors, as well as to the development of new types especially suited to some particular application, but it may not be fully appreciated how much is due to the still greater advance in the developments made in the *controlling devices and equipment used with these motors.*

Industrial controllers—a term embracing all such devices and equipments—exist in such an astonishing variety of types and forms as to confuse anyone not an expert in this field. The selection of a proper motor for a given service, apart from that of a very special nature, is a relatively simple matter and concerns chiefly the power available, the work to be done, and the general conditions surrounding the installation. While this is usually given intelligent study, it is often true that the controller is chosen with less care and understanding.

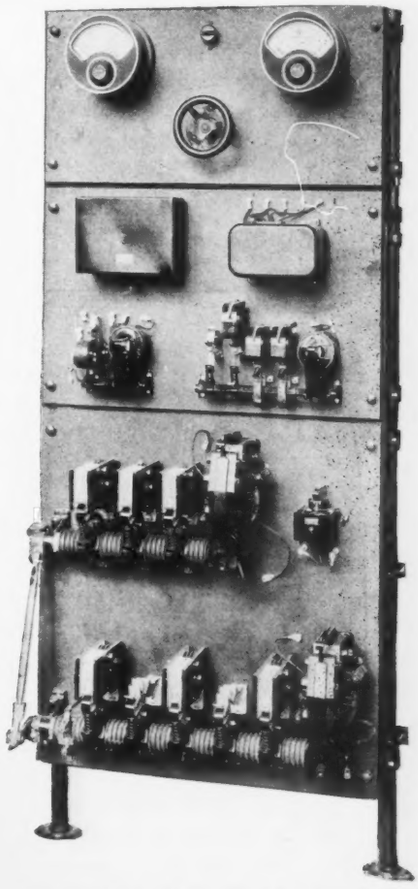
It is not sufficient that the controller permit the motor to go through its desired performances. Consideration is due the wearing qualities of the device; the safeguards afforded the motors, the machine, and the material handled; the elimination of hazard to life and limb; the convenience as to installation, inspection and repair; the economies of operation and other factors that merit attention. The consideration that merits least attention is that of first cost. The controller for a motor driving a given machine plays ordinarily a very minor part in the cost of the complete installation, but its failure in any way to maintain service or to get the best work out of the equipment will quickly counterbalance any false economy in its selection.

Therefore, it is worth while to understand better the industrial controller in its seemingly endless variety and—in many cases—complexity. A study of what it has to do and the various methods of accomplishing the results will make relatively simple the selection of the right device for almost any service except that of a highly special nature.

Selection of the Controller

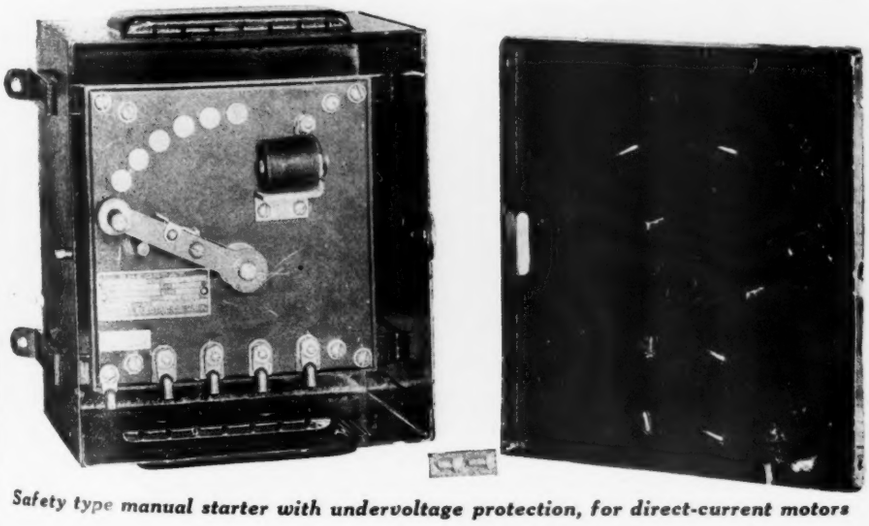
Having chosen our motor in view of the power supply and the characteristics, it must possess to meet the service requirements, let us select our controller. This cannot be done by going through a list of the various types available in their countless combinations, but we can bring up one after the other the fundamental considerations and arrive at what we are searching for by a process of elimination. Let us first consider:

THE DUTY AND SERVICE—By the "duty" we mean the specific functions for which the controller is designed. Is it merely to start the motor and is the load to be accelerated light or heavy? Or is speed control desired and if so by what method? The motor must largely tell us whether the method is to be by armature or field rheostat, winding or voltage change, brush shifting, etc.



Automatic starting panel for synchronous motor, with exciter and field ammeters, field rheostat, definite time accelerating relay, thermal overload relay and field actuating relay

Must the motor be reversed and throughout the entire speed range? Must it be



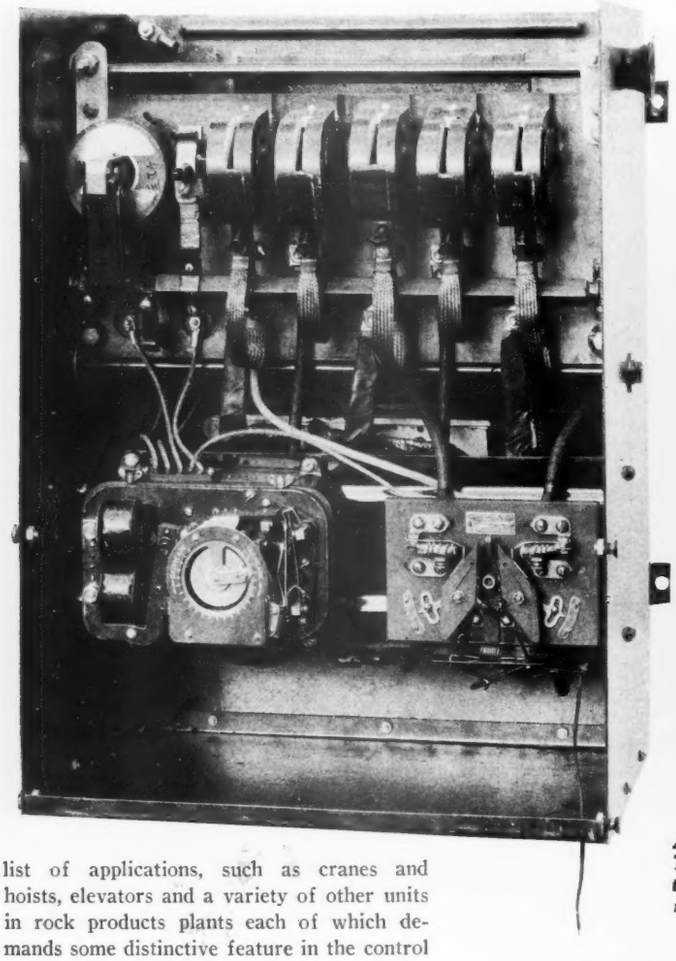
Safety type manual starter with undervoltage protection, for direct-current motors

brought to rest quickly and is a "solenoid brake," "dynamic braking," or "plugging" best?

By "service" is meant the specific application in which the controller is to be used, for example:

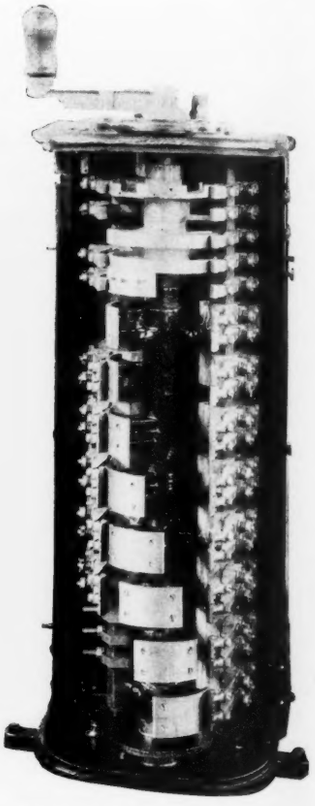
(a) General purpose, which covers occasional starting of motors.

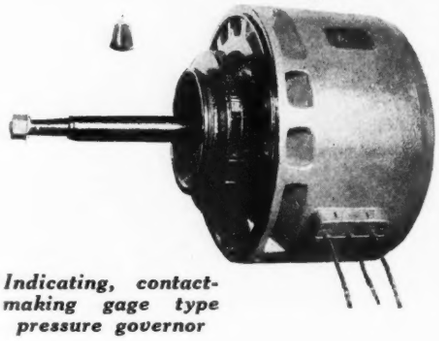
(b) Special purpose, which covers a long list of applications, such as cranes and hoists, elevators and a variety of other units in rock products plants each of which demands some distinctive feature in the control in the way of capacity, specific functions, and other points considered later in this discussion.



Below (left)—Automatic compensator (cover removed) with definite-time accelerating relay, double-pole thermal overload relay with string reset and air break contactors with magnetic blowout.

Above (right)—Typical drum controller (cover removed) with self-aligning contact fingers





Indicating, contact-making gage type pressure governor

Protection to Motor and Machinery

The following is a tabulated summary of the protective features that may be essential. Several of the items could be discussed at length to advantage, particularly those concerning ways and means to secure adequate overload protection, the relative merits of various motor starting methods, and the advantages of the several automatic accelerating schemes.

(*a*) *OVERLOAD PROTECTION*—The motor should be safeguarded against injurious overload. This may be accomplished by:

(1) Fuses (these have definite limitations as to protection afforded).

(2) Circuit-breakers — Instantaneous and time-element.

(3) Relays affecting contactors — Instantaneous and time-element; Hand, gravity and remote reset.

(4) Thermal devices.

(*b*) *UNDER-VOLTAGE RELEASE*—Motors that cannot be thrown directly on the line in safety to themselves should have starters equipped with under-voltage release.

(*c*) *PROTECTION AGAINST TOO HIGH INRUSH AND SHOCK TO MACHINERY*—

(1) Starting resistance, d.-c. and a.-c.

(2) Compensator starter, a.-c.

(3) Y-Delta starting, a.-c.

(4) Prevention of too quick reversal of motor.

(See the N. E. L. A. regulations limiting current inrush to prevent voltage disturbance on power lines.)

(*d*) *PROTECTION AGAINST TOO RAPID ACCELERATION*—Too rapid acceleration may be the cause of heating or sparking of the motor, or of undue shock to the driven machinery and the material or fabric handled by it. Ways and means of prevention are:

(1) Time limit acceleration.

(2) Current limit acceleration.

(3) Acceleration controlled by voltage change across armature or resistor.

(4) Field accelerating relays.

(*e*) *PROTECTION AGAINST OVER-TRAVEL OF MACHINERY*—

(1) Limit switches.

(2) Overwind device.

(*f*) *OVERSPEED PROTECTION*—Required only in special cases.

(*g*) *PHASE REVERSAL AND PHASE FAILURE PROTECTION.*

(*h*) *SUDDEN STRENGTHENING* of field at high speed will result in a voltage jump that must be taken into consideration in some instances.

Safety to Persons

For many reasons (humanitarian, economic and legal) much attention is given to the safety precautions surrounding industrial machinery, and this is particularly true of the electrical equipment, where we find many safety features embodied in up-to-date control that afford security to the operator, repair men, and other persons. Some of these features are:

Undervoltage protection automatically prevents the motor from restarting, without personal intervention, after failure of power. The casualties that might result from the unexpected starting of machinery are obvious. Phase-reversal protection is essential

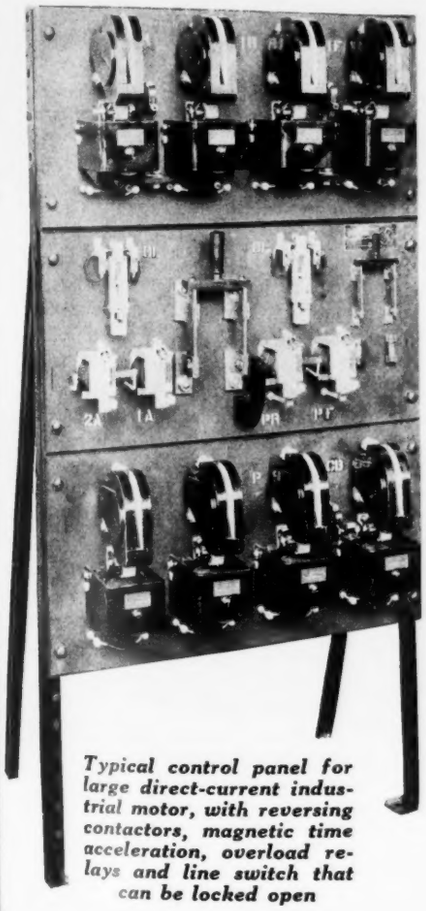
for elevators and other machines where unexpected motor reversal would be hazardous.

Enclosure of the live and working parts of the control equipment, as a safeguard against shock or burn, is now the rule and there is no excuse for the installation of open-type starters or control of any kind except where isolated and accessible only to qualified persons. Suitable enclosing cases also exclude inflammable dust and will prevent the arcing of the controller contacts from being communicated to an explosive atmosphere.

Locking features are available to prevent operation while work is being done in inspecting, cleaning, adjusting or repairing the machine or its equipment. Where a machine, such as a primary crusher, is controlled from several stations, it is possible at any station to lock against operation from another.

Emergency stops in case of need can be provided to shut down the motor from any given point and to quickly stop it by braking or plugging. Limit switches to prevent overtravel as for elevators, cranes and valves, and devices to prevent overspeed in handling dangerous material such as molten metal are an every-day requirement.

There exist safety codes of national, state and local character that deal more or less fully, as the case may be, with regulations to eliminate hazards. None of them, fortunately, demand anything beyond what is reasonable; and there is reason to hope that all will be ultimately gathered together in what may be generally accepted as an American Standard.



Typical control panel for large direct-current industrial motor, with reversing contactors, magnetic time acceleration, overload relays and line switch that can be locked open

Special Conditions

The following is a list of special conditions surrounding the installation which may require special protection of the controller:

(*a*) Prevalence of gas or acid, as in mines, chemical works, etc.

(1) Protection of controller from corrosion.

(2) Suppression of arcs that might ignite gases.

(*b*) Mills handling powder, sawdust or other explosive or highly inflammable material—suppression of arcing.

(*c*) Protection from water.

(1) Splash-proof.

(2) Moisture-proof.

(3) Immersion-proof.

(4) Special protection from action of salt water.

(*d*) Fire prevention measures in general. (See Underwriters' code.)

Convenience and Economy of Operation

In selecting the controller best suited for the purpose in mind its convenience to the operator should not be overlooked. Particularly with machinery, the work in which requires constant attention, it is important that the operator find the control within easy reach and manipulated with little care and effort. Some of the things to be remembered in this connection are:

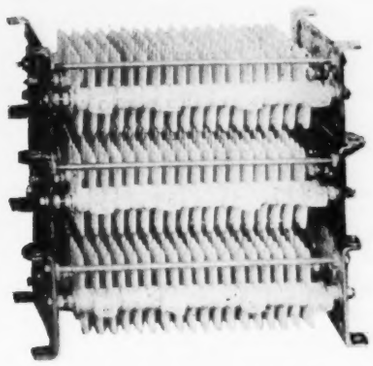
(*a*) Push button or master switch operation of magnetic controllers insures a minimum distraction and responsibility of the operator and a maximum production economy.

(*b*) A control equipment composed of several segregated parts often permits the manually manipulated parts to be most conveniently located for operation.

(*c*) The frequency of manipulation and the force required to move the controller arm will determine if a manually operated device will answer the purpose.

(*d*) The direction of movement of the controller handle should be considered, particularly on cranes, elevators and hoists.

(*e*) Control from more than one station, as for large crushers, conveyors, etc.



Available Controller Types

Having then determined what our controller has to do and what characteristics and features it must possess, let us turn to the various types available, which, as has been said, offer many combinations, and see what we can find.

One way of broadly subdividing industrial controllers is by the construction of the switching devices. The present day types fall chiefly into three classes, namely—

Mill-type manual starting compensator with ammeter and jack-type disconnecting switch, in gasketed cast-iron case

(1) Face plate, including dial and knife or snap switch types.

(2) Drum types.

(3) Magnetic types.

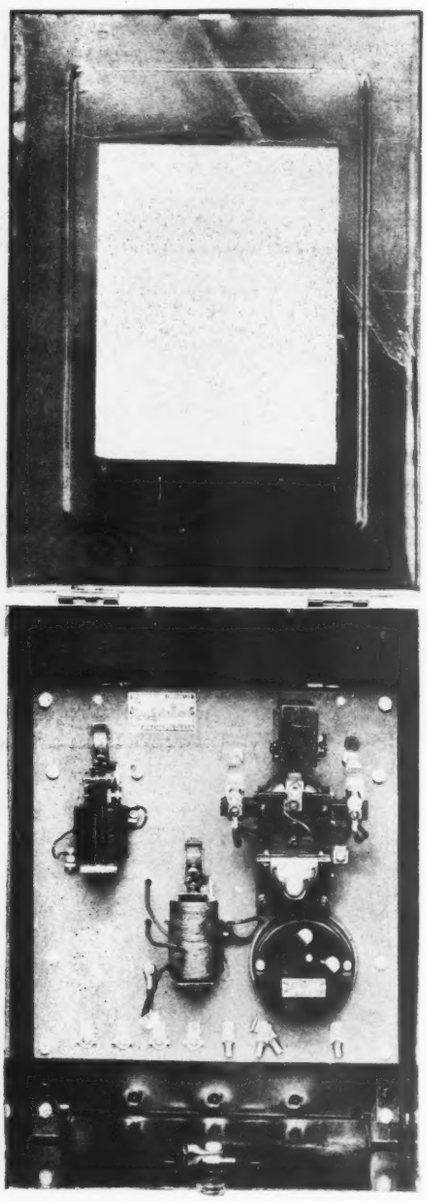
The first class covers chiefly general purpose starting devices and certain lines of dial controllers on which the duty is not particularly severe. They are available with adequate protective features and safety enclosures, but they are limited to fairly light duty.

Drum controllers in the industrial field are particularly well adapted to manual operation for heavy service, such as cranes, hoists, and machine tools. Before the advent of magnetic control, drum controllers were used quite generally and successfully for

severe service on large size motors to which it is now quite common to apply magnetic control.

The nature of the service tells whether our controller shall be a manual type, a semi-automatic, or a full-automatic type. By manual type we mean one requiring hand operation, and by semi-automatic type one that requires at least the initial operation be personally directed by pressing a button or some other means. By full-automatic is meant a combination such as a pressure governor and magnetic starter that without attention will start and stop to maintain within limits the pressure in a water-supply system. A magnetic controller, therefore, may be manually operated by means of a master switch that serves to energize magnetic contactors.

We may be interested in the accelerating method employed in a magnetic starter where the acceleration is automatic. We may find that time element is best suited to our purpose; or perhaps a current limit scheme, one responding to the increasing voltage on the motor armature or the decreasing drop across the starting resistance, is preferable.



Enclosed magnetic starter with series contactor acceleration and single-pole thermal overload relay, for direct-current motors

When it comes to the kind of current reduction in starting motors larger than those that can be thrown directly on the line, we will take it for granted that a resistor of some sort is the thing to use in connection with d.-c. motors, and with single-phase and slip-ring, multi-phase motors. The squirrel cage induction motor, however, may, if the power rules permit, be thrown directly on the line in large sizes, and where some method of current reduction is required, we may find reason to consider the relative advantages of a resistance starter as compared with an auto-transformer starter. The latter, or commonly called "compensator," has the advantage of putting into the motor more current than it takes from the line, and so far has proved to be the popular device for starting squirrel-cage motors when the starting current is limited.

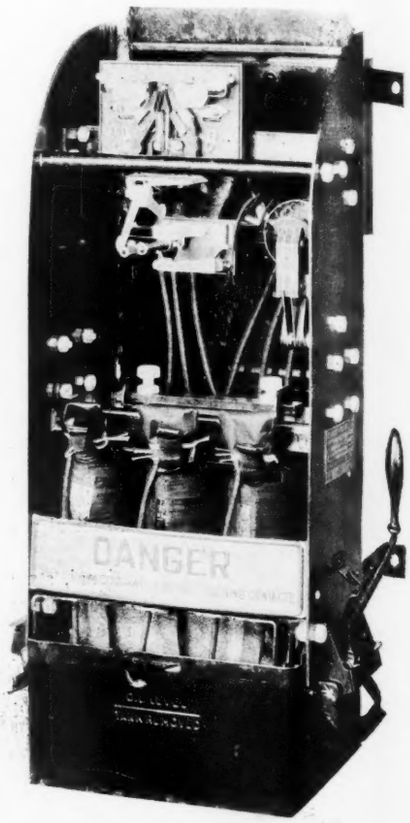
Controllers of both open and enclosed types are available, and the former are rapidly going out in favor of the latter. The manual types have external operating handles, and the cases of both the manual and remote control types can be locked shut for safety reasons.

Some controllers will be found to be oil immersed, a feature that is of particular advantage for three reasons; i. e., to afford good insulation between closely assembled switching parts of opposite polarity; to safeguard the switching mechanism against corrosion; and to prevent arcing of the switch parts from reaching the outside atmosphere where explosive dusts or gases may be present. Oil immersion, contrary to the general impression, is not of any advantage as regards the life of the submerged making and breaking contacts. The same contacts in air with an adequate magnetic blow-out will last ten times as long as they will when under oil and with the same breaking distance. Controllers subject to frequent service should not have oil immersed switches as the oil will rapidly carbonize and become a menace.

As accessories to controllers, especially the magnetic types, we will find available push-button stations, master controllers, float switches, pressure and vacuum governors, thermostats, limit switches, etc., which will permit us to effect practically any combination as desired for the control of the motor.

Magnetic Control

Much of the increased usefulness of the electric drive in its application to machinery performing more or less complicated evolutions has been made possible by the remarkable developments in the art of magnetic control. Improvements in magnetic contactors, prolonging the life of the contacts and the wear of the device as a whole, have permitted frequent duty cycles of starting, stopping and reversing so that now we see motors direct connected to reversing planers, slotters and similar machines and put through their paces, as demanded by such service, easily and safely by an automatic magnetic control that functions incessantly with little attention.



Manual starting compensator (cover removed) with oil-immersed switch, undervoltage protection and double-pole thermal overload relay

Magnetic control provides for remote operation from push-button stations, or other forms of master switches, from one or any number of points. The value of this arrangement in connection with the operation of machinery such as conveyors and automatic elevators, is obvious. It is possible not only to control the machine from any point, but also to lock it against operation from any other point. Such locking safeguards anyone at work on machinery against unexpected restarting.

Magnetic control is employed where automatic operation is required, as in the case of motors driving pumps, which through the medium of a float switch or pressure governor are automatically started and stopped as the water level or pressure rises and falls. Automatic control of temperature can likewise be accomplished utilizing a thermostat as the pilot control device. The advantages of magnetic control as compared to manual control can be summed up briefly under the following heads:

(1) *Ease and convenience of operation.* It

is obvious that an operator can more easily manipulate push-button stations, or a small master switch, than he can the lever of a large manual controller, and, furthermore, it is possible to place the small master device more convenient to the operator's position than is very often the case with a large manual controller.

(2) *Magnetic control provides for automatic acceleration* either by time element, current limit, or some other method, and the motor is thereby safeguarded against

Float switch and mechanism

current surges that will result from careless manipulation of a manual control. Furthermore, the operator is not distracted from the work of his machine by paying attention to the careful manipulation of a manual controller. He can push buttons or throw a master switch back and forth with full assurance that the motor will not be abused thereby.

(3) *It is possible to install the magnetic controller* where space is conveniently available, off at one side or slung up overhead out of the way. Magnetic control can be more easily installed in a direct line from the power supply to the motor, merely running pilot wires to the operator's position. This often makes possible considerable economy in wires and cables.

(4) *The automatic acceleration of the motor,* as well as the ease of bringing it quickly and safely to rest, are also of advantage in safeguarding the driven machinery and the material that may be in it from undue strain or breaking.

(5) *Under conditions of frequent and heavy duty,* magnetic control has much longer life than manual control even with equally sized contact making parts and equally efficient magnetic blowouts. Magnetic switches close and open with a quick action which is not possible with manually operated contacting devices. Magnetic controllers will also be found more accessible for inspection and repair. From every standpoint, therefore, they are easier to maintain in good operating condition.

(6) *From the standpoint of safety to operators* and other persons, the magnetic controller is superior, because it can be located out of the way and is less likely to be tampered with. Furthermore, it lends itself to quick stopping by emergency switches and, because of the fact that it will more easily and accurately accelerate the motor and machinery, is an element of safety. Undervoltage protection, i. e., a safeguarding to the operator against unexpected restarting when power returns after failure, is more surely provided by magnetic control and, generally speaking, the overload protection afforded the motor is more dependable.

Dial and drum starters and controllers have undergone many recent improvements particularly as regards safety precautions, and are fully suitable for the purposes intended, particularly where the motors are small or the service infrequent. Magnetic control, however, is the rapidly growing branch of the art in both size and variety and has outgrown the ability of many people interested in the application of industrial motors to keep up with the advance made.

General Electric Machines Now Constructed by Welding

WHAT promises to be a revolutionary step in the manufacture of electric machinery is the adoption of electric arc welding for the fabrication of many types of machines by the General Electric Co. This practice, as outlined in an article by R. H. Rogers in the July issue of the *General Electric Review,* results in many decided advantages over the use of castings.

Electric arc welding, which has recently attracted world-wide attention because or its possibilities in replacing rivets in the construction of buildings, was first tried out in the construction of electric machinery by the General Electric Co. some years ago. The many advantages which attended its use soon became so obvious that its field was rapidly widened until at the present time a very large percentage of General Electric machines are constructed by the new method.

Among the applications for which electric arc welding is used in the General Electric shops are magnet frames and armature spiders for direct-current motors and generators and synchronous converters; stator frames and rotor spiders for alternating-current machines; bases, bearing pedestals, guards and air shields or deflectors for various types of machines, etc. In addition to these electric machines, transformer tanks, oil circuit breaker tanks, switch mechanisms and control devices, electric refrigerators, mercury boilers, centrifugal compressors and many other types of equipment are constructed to a greater or less extent by the use of electric arc welding.

When castings are used it is necessary to maintain pattern shops, pattern storage, core shops and ovens, and foundries, together with space and equipment for making castings ready for the machine shop. Defects arising after a casting has been poured, cooled and annealed result often in long delays in the completion of a given machine, and these delays are eliminated with the use of welding. Other disadvantages attendant upon the use of castings and eliminated by the use of welding include loss of metal in the casting process, use of excessively heavy parts for light duty, high machining costs.

Electrically arc welded machines and parts, in addition, have the following advantages: they have the same strength as castings but are considerably lighter in weight; designs are not restricted to existing patterns; less copper is needed to produce the same density of field flux in rotating machines; greater freedom in ventilation is provided; smaller revolving weights and diameters are allowed.

In the case of large electrical units, each machine is usually built "to order," and has to be designed, to a large extent, specially throughout. When castings are used, this necessitates the preparation of special drawings, patterns, and often pits in the foundry. Such work is much simplified when electric arc welding is used, because of the freedom with which standard slabs, plates, sheets and bars can be shaped and the speed and ease with which parts can be arc welded together, including reinforcements.

Another advantage of the new method is the freedom from breaks in machine framework. When a casting is accidentally dropped or some other accident occurs, a foot may break off or a crack develop, and these rarely can be repaired. With machines fabricated by the welding method, there is little possibility of breakage in rough handling, and any damage resulting therefrom can be more readily repaired.

The General Electric Co. uses both hand and automatic welding in this work. The welding is, however, done largely by automatic machines which impart the desired motion to the electrode that, in turn, is fed automatically from a reel to the arc which forms the weld at a rate of 6 in. per minute. Hand welding is done around fittings and on short seams in general.

New Machinery and Equipment

New Speed Reducers with Silent Chain Drives

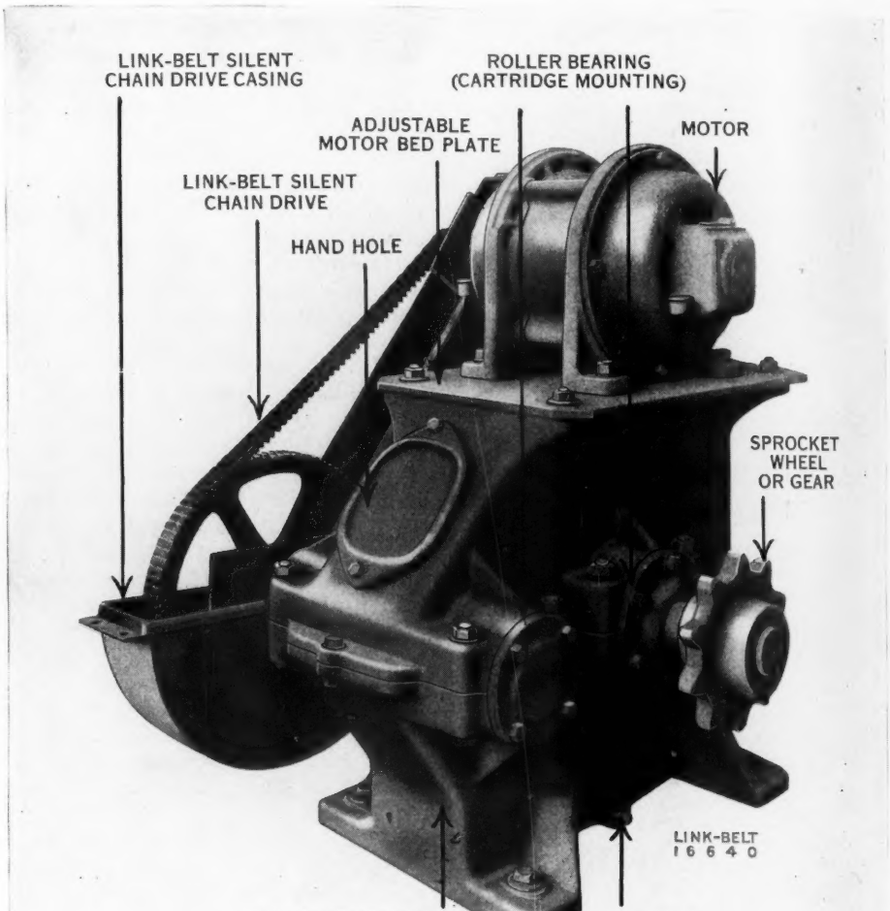
TWO new types of speed reducers have been recently brought out by the H. W. Caldwell & Son Co., Chicago—type "A" designed primarily for conveyor, elevator and general industrial service and type "B" for driving screw conveyors. Each reducer is a self-contained unit which combines two separate drives: a Link-Belt silent chain drive from the high speed shaft, and a cut spur gear drive to the low speed shaft; made in sizes to furnish ratios from 7:1 to 40:1 in Type "A," or to 30:1 in Type "B."

The cast iron housing is ruggedly constructed, assuring proper support and alignment. It is so constructed as to prevent oil leakage, and to exclude dust and dirt from the working parts. The housing has a large hand-hole for inspection purposes. The upper part of the housing can be separated from the lower part without disturbing the mounting of the motor.

Timken tapered roller bearings, carried in cartridge mountings, support the oversize shafts. Outboard bearings are unnecessary. The silent chain drive is used in place of a flexible coupling to provide flexibility between motor and speed reducer shaft.

Other advantages claimed for the machine are:

Automatic lubrication of gears and bearings from large oil reservoir in base of housing; economy of floor space, motor being mounted on top of housing; adjustable motor bed plate facilitates proper adjustment of chain; accessibility of all parts—upper half of housing of type "A" reducer can be removed without disturbing the lower half and housing of type "B" reducer is split vertically; speed ratios may be changed at any time by substituting different size motor pinion, or silent chain wheel; few working parts; low up-keep, and low first cost.



Speed reducer combining cut gear and silent chain drives

New and Powerful Mine Locomotive

THE 20-ton Baldwin-Westinghouse haulage locomotive shown at the American Mining Congress is claimed to be the most powerful mine locomotive ever built, having two 150-hp. motors. Being the first of its type, this locomotive is said to incorporate the latest refinements of design dictated by results of past operating experience.

On an average, one per cent grade against the loaded trip, this locomotive, it is claimed, will haul 50 loaded 2½-ton capacity cars at a speed of 9 miles an hour. The average trip will consist, it is said, of 40 loaded cars hauled up an average grade of 0.9% at an average speed of 10½ miles per hour and for a distance of 10,000 feet.

Some of the features of the design of this locomotive are: Barsteel frame, electro-pneumatic control for series-parallel operation, air sanders, relay overload protection, leaf springs, through-bolts throughout, Timken roller bearings for journals, Timken roller armature bearing on motors.

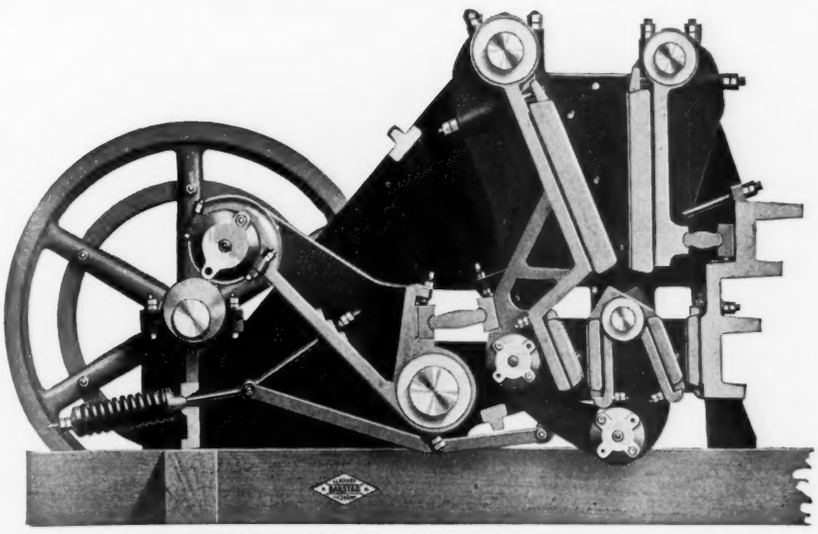
Arc Welding Instruction Manual

THE Lincoln Electric Co., Cleveland, Ohio, has just issued the 1927 edition of the "Instruction Manual." This publication, which is revised annually to cover the latest practices used in manual electric arc welding, is of interest to practically everyone who uses arc welding. Among the subjects treated are: high-speed steel welding, high-pressure pipe welding, automobile frames, boiler repairs, welding cast iron, manganese steel welding, carbon arc welding, manufacture of machinery and equipment using welded steel in place of castings. Copies are available at $1 each.

Three Jaw Crushers in One

A NOVEL jaw crusher, embodying three movable jaws, instead of one, has been placed on the market by the Bakstad Machinery Co., Elkhart, Ind. The first large size crusher of this design has been in successful operation at the Elkhart Sand and Gravel Co. plant, Elkhart Lake, Wis., for several months. Some views of this plant and crusher installation are shown herewith.

The essential details of this new crusher are shown in the accompanying illustra-



Section showing how primary and secondary crushers are combined in on machine

tions. It is really a primary and secondary crusher combined. The primary crusher mechanism is similar to that of a standard jaw crusher. The discharge of the primary jaws drops upon an oscillating grid, so that the output feeds both ways into two secondary jaw crushers. The same mechanism from the main drive moves all three jaws in unison.

The primary moving jaw is suspended from a shaft supported in the crusher frame. An extension of the primary moving jaw carries one of the secondary crushing plates. Between this secondary crushing plate and the secondary crushing plate which is fastened rigidly to the crusher frame, is an intermediate crushing jaw, suspended from a shaft in the main frame, which carries two sets of removable, or renewable, crushing plates, thus forming the two secondary crushing units.

The intermediate jaw is connected by a link to the main moving jaw, which receives its crushing motion through an adjustable safety toggle from the lever, carried by a shaft in the frame. This lever is raised and lowered by the roller it supports in one end, as the cam shaft, carrying the flywheels and belt pulley revolves.

The three sets of jaws open and close in unison, and the stroke in the lower jaw movement is a little more than one-half the movement of the upper, or primary, jaw. The openings are adjusted by changing the main toggle, which affects both the primary and secondary jaw openings, leaving the secondary jaw opening equal. There is an independent adjustment for the primary jaw setting.

The frame and all the principal crusher parts are machined cast steel. The bearings are designed to be dust-proof, and are provided with high pressure lubrication throughout. The crushing plates are manganese steel, reversible to provide for wear, and interchangeable from stationary to moving jaws in both primary and secondary crushing units. The cam, roller, and all bearings are machined high-carbon hammered steel.

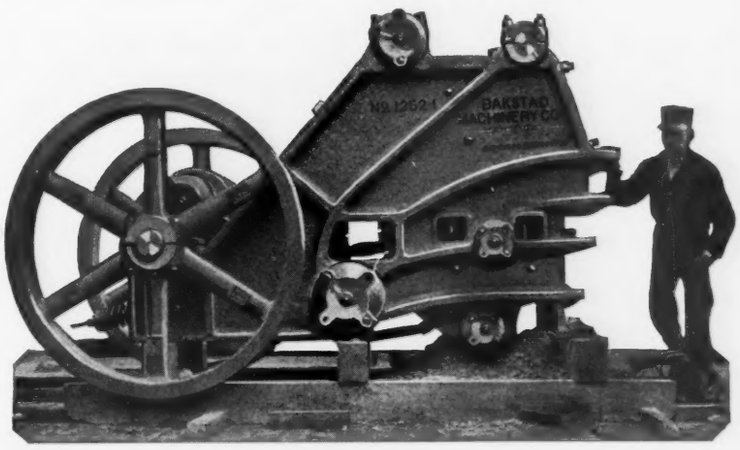
The adjusting toggles, wedge bolts, etc., are claimed to be readily accessible, and the secondary jaw openings can be reached through portholes in the side frame of the machine.

The crusher design is patented.

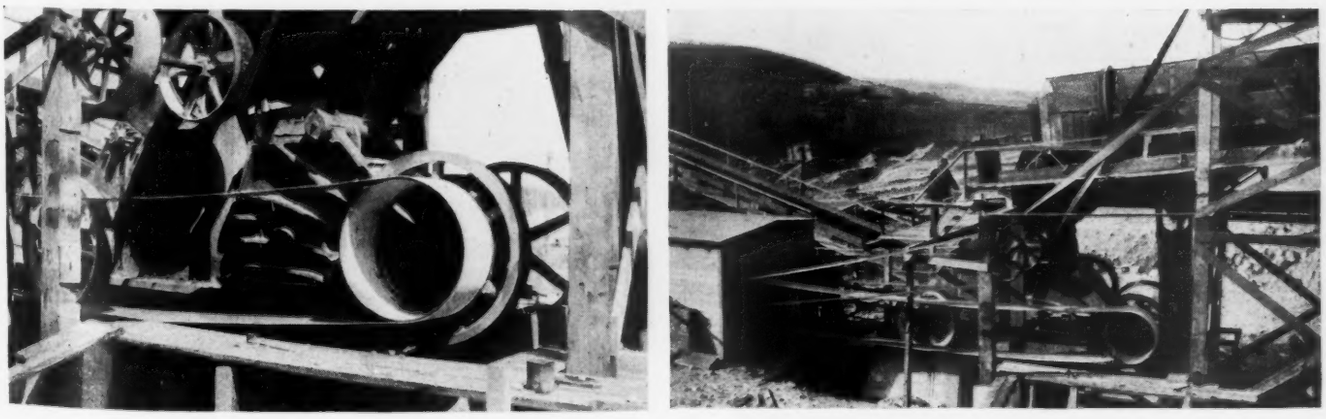
New Tire Chain for Trucks

THE Columbus McKinnon Chain Co., Columbus, Ohio, have brought out a new type of tire chain for pneumatic truck tires, called the "Oil Field Special." It is said to be of extra heavy construction and by actual test in the oil fields of Texas and Oklahoma claimed to be quite efficient over long unused trails.

This type of chain is said to be adaptable for use on trucks used to haul strippings, etc., the conditions encountered being quite similar to that at the oil fields—occasional rock exposure in heavy mud or loose ground.



A large size of the new double crusher



Two views of double crusher installed in Elkhart Sand and Gravel Co.'s plant

News of All the Industry

Incorporations

Webster Gravel Co., Inc., Minden, La., $12,000. W. T. Drew, W. P. Devereux and R. E. Lee.

Minot Concrete Products Co., Inc., Minot, N. D., $25,000. P. L. Aerhus, S. S. Reisbus and others.

Huber Rock Corp., Tallahassee, Fla. Frank L. Webb, Morris Huber and others.

West End Sand Co., Louisville, Ky., has increased its capital from $15,000 to $30,000.

Columbia Digger Sand and Gravel Co., Portland, Ore., $10,000. E. E. Crout, W. W. Taylor and O. F. Barsian.

Uwharrie Minerals Co., Winston-Salem, N. C., $300,000. H. L. Harper, Thomas Wilson, W. R. Weir, Belews Creek Rd.

Huron Portland Cement Co., Detroit, Mich., $12,000,000; to do business in New York state with offices at 1335 Main St., Buffalo, N. Y.

Certain-teed Products Corp., Philadelphia, Penn., is arranging to increase its capital stock from 500,000 to 1,000,000 shares of no par value. R. M. Nelson is secretary.

Rockfield Lime and Stone Co., Rockfield, Wis.; to prepare lime for market and manufacture lime products. Peter J. Hayes, Edward R. Gettings and Mable W. Raimey.

South Jersey Silica Sand Co., Bridgeton, N. J., $100,000 preferred stock and 3000 shares no par value common; produce sand and gravel. Douglas V. Aitken of Bridgeton, president.

Mystic Stone Quariers Co., Louisville, Ky., $30,000. Clark S. Lampton, 1350 S. Sixth St.; Charles A. Staebler, St. Matthews St.; W. L. Staebler.

Standard Sand and Gravel Co., Augusta, Ga., $35,000. F. Lewis Marshall, 1131 Highland Ave., Augusta. John D. Twiggs and others have acquired and will develop a large tract of land.

Newport Sand Bank Co., Newport, Ky., is to be reincorporated and will continue its old operation. George W. Dye, Mrs. Laura C. Spinks and Richard Carothers are the interested parties.

Graphite Products, Inc., Providence, R. I.; to manufacture, buy and sell graphite and graphite products. Esther Gordon and Daniel McIver of Providence, Everett D. Higgins of East Providence.

Ohio River Sand and Gravel Co., Pittsburgh, Penn., $1,500,000; to take over and expand the Ohio River Gravel Co. Carroll C. Robertson, Oliver Bldg., and James H. Aupke, 1202 Woodlawn Ave., both of Pittsburgh.

Superior Cement Co., Superior, Ohio, formerly a subsidiary of the Wellston Iron Furnace Co., Wellston, Ohio, has been incorporated as an independent company to manufacture building materials, with S. E. Stephenson as president.

River Products Co., Nashville, Tenn., $100,000; to produce sand and gravel and deal in clay, clay products and building materials. The company will have its yards at First and Jefferson Sts., Nashville, and will start operation in about 60 days with one dredge, five barges and a towboat. Jordan Stokes, Jr., A. J. Swain, John J. Lowe and John H. Parmelee are the interested parties.

Quarries

Ottawa Stone Co., Gilboa, Ohio, rock crushing plant has been put in operation.

Georgia Granite Co. has installed a rock crusher at its Granite Hill, Ga., quarry with a five car per day capacity.

Basalt Rock Co., of Napa County, Calif., will erect large storage bins, etc., on the water front in Vallejo, Calif.

Rock Quarry Co., Zephyrhills, Fla., will soon start operating, employing approximately 100 persons, with a weekly payroll of about $2,500.

Smith-Cascadden quarry, near Lapel, Ind., has purchased a rock crusher which will be used for crushing limestone for agricultural use.

W. W. Boxley & Co.'s Pounding Mill, Va., quarry celebrated its fourteenth anniversary on July 11. On July 11, 1913, the first crushed limestone was produced and since that time the operation has grown steadily until it now turns out about 20 cars per day. W. W. Boxley, C. M. Hunter and A. G. Hill are the principal stockholders and all are from Roanoke, Va.

Purdue University, Lafayette, Ind., students in the engineering school and their instructors recently visited Bloomington and Bedford, Ind., to inspect the stone quarries and mills in this section.

Mutual Oolithic Stone Co., of which C. A. Colren, Western Union Bldg., Bloomington, Ind., is secretary, is having plans drawn for a stone mill at Ellettsville, Ind.

Henry E. Winchester, a well-known granite man of St. Cloud, Minn., has found a deposit of granite twenty miles north of Chisholm, Minn., which is similar to the granite of Barre, Vt.

Atlas Mixed Mortar Co., Los Angeles, Calif., has leased its Stough Canyon quarry for 20 years to Stine & Ellis of Burbank, Calif., who will spend between $30,000 and $40,000 in improvements and additions to the plant and equipment.

Wisconsin Granite Co., Redgranite, Wis., had quarry equipment, including the hoist, hoist house and several electric motors, damaged to the extent of about $5,000 when lighting struck the power line leading to the building. Reconstruction work has been started and operation is expected to resume soon.

Public Service Commission of Montreal, Que., Canada, has been called upon to appraise the value of some Montreal quarry property which is required by the city for the joining of Rosemont Blvd. and De Fleurimont St. Adrien Beaudry, president of the commission, has invoked expert testimony from a quarry specialist from Toronto to aid the court in deciding if quarry has been worked out or if it is still good as a source of stone.

Sand and Gravel

Lauderdale Realty Co., Ripley, Tenn., has a tract of land on which it will develop gravel deposits.

X. L. Sand and Gravel Co., Duncan, B. C., is building a sand-lime brick plant at Duncan which will cost approximately $50,000.

E. F. Cole recently announced the opening of a new gravel pit north of Poneto, Ind. It is estimated to contain about 30,000 yd. of gravel.

Grand River Gravel Co., Manhattan Bldg., Muskogee, Okla., will install new equipment at its 750-ton plant in Fort Gibson, Okla.

Lake Bryan Sand Co., Vineland, Fla., has acquired 200 acres of land at Vineland and has installed a complete pumping plant with a daily capacity of from 8 to 10 cars per day of silica sand.

Lewisburg, Ohio, has a new washed and crushed gravel plant, owned by R. H. Foster. The deposit is worked by a dragline bucket and has a daily output of about 100 yd.

Blue Diamond Co., Los Angeles, Calif., has installed two 5-ton scrubber screens at its sand and gravel plant. The screens were furnished by the Standard Boiler and Steel Works of Los Angeles.

West Michigan Core Sand Co., Muskegon, Mich., formerly the Nugent Sand Co., is continuing the work of leveling the sand ridge in Lake Michigan park and will soon start on the removal of Pigeon Hill.

Myers' Gravel and Sand Co., Anderson, Ind., through Lindfield Myers, owner, has presented an ordinance to the city council providing for the annexation of the 13 acres comprising the company's property to the city of Anderson. The reason given is that since the company sells gravel to the city and its trucks use the city streets it believes that it should pay taxes.

Silica Sand

Belgian silica sand is reported coming into the Pacific coast market at Oakland, Calif., under a charter rate of 35 shillings (about $8.50) per ton.

California Stucco Co. intends to begin operations soon at its silica sand plant on Green River near Auburn, Wash. About 20 tons are to be produced daily.

Cement

Canada Cement Co. has started the erection of a machine shop at Lakefield, Ont.

Sandusky Cement Co., Cleveland, Ohio, has plans for an addition, soon to be erected at its West York, Penn., cement mill, for manufacturing gray cements, at an estimated cost of $250,000 with equipment.

Cement Products

Northwest Concrete Products Association held its midsummer convention July 29 and 30 at the Hotel Astoria, Astoria, Ore.

J. H. Conrath Duntile Co., Jefferson City, Mo., has begun production. It is said to have an output of seven tile per minute.

Shearman Concrete Pipe Co., Inc., 201 N. Clinch Ave., Knoxville, Tenn., is reported establishing a branch concrete pipe manufacturing plant in Savannah, Ga.

Elkan Stone Tile Mfg. Co., Macon, Ga., of which Stanley A. Elkan is manager, has acquired five acres and will erect plant with capacity of 6000 stone-tiles per day.

Montana Concrete Products Co., Helena, Mont., contemplates erecting a new plant for the manufacture of reinforced concrete pipe and allied products, to cost about $25,000.

United States Equipment Co.'s Lyons, Ill., concrete block manufacturing plant was recently damaged by a fire caused by the explosion of a gasoline blow-torch. The damage is estimated at about $40,000.

Wisconsin Ready-Mix Concrete Corp., Milwaukee, Wis., has been organized by a group of local construction men, to manufacture and deliver in specially constructed trucks, ready-mixed concrete to any sized job within Milwaukee county. About $150,000 will be invested in equipment.

Gray Concrete Pipe Co., Thomasville, N. C., has received the contract for furnishing the concrete pipe for the storm drainage system to be constructed in connection with an underpass program in progress at Greensboro, N. C., and may locate a branch manufacturing plant in Greensboro, according to unofficial announcements recently received.

Gypsum

A new gypsum plant, it is reported, will be built in Washington by a British Columbia syndicate. Either Bellingham or Tacoma will be chosen as a site.

United States Gypsum Co., Chicago, Ill., has let the contract for its new 60x200-ft. one-story factory branch and distributing plant at Philadelphia, Penn., to Metzger, Fisher & White, Otis Bldg., Philadelphia, at an estimated cost of $40,000.

Miscellaneous Rock Products

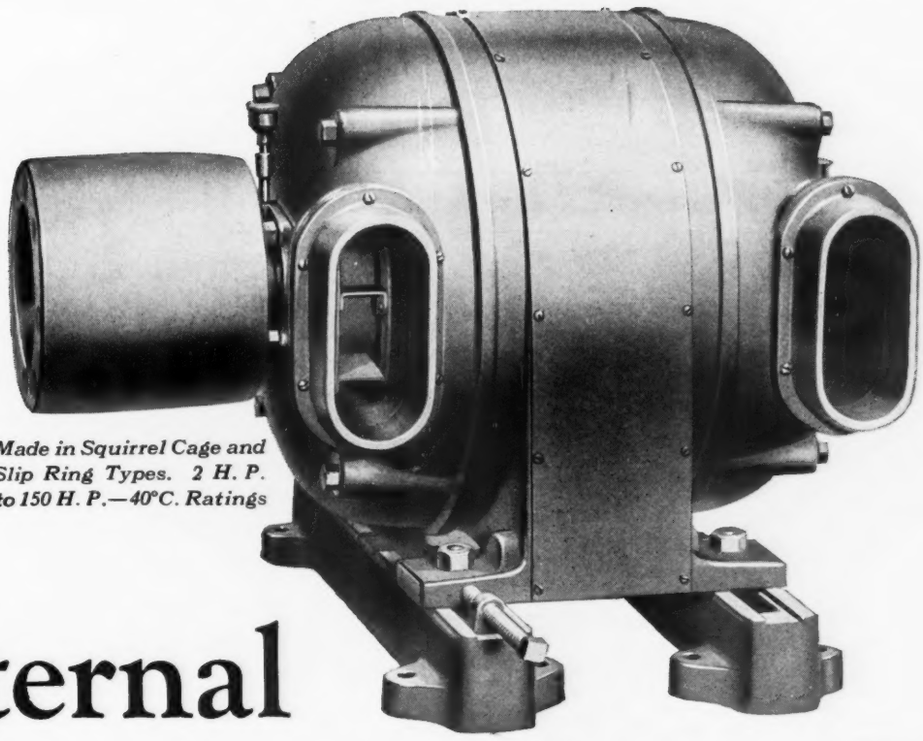
National Asbestos Co., Minneapolis, N. C., the newly incorporated company reported in the July 23 issue, has acquired property at Minneapolis on which it plans to built a plant to cost approximately $65,000.

Natural asphalt deposits containing sufficient silica to make it adaptable for road building purposes have been discovered in Vernon county, Missouri, and will be developed by eastern interests, according to the *Bronx* (Mo.) *Home News*.

Personals

E. R. Standfuss, works manager for the Harnischfeger Corp., Milwaukee, Wis., was recently elected vice president of the corporation.

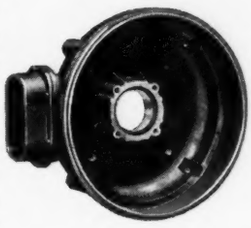
J. W. Hoover, formerly state highway commissioner of the state of Washington, is now manager of the Superior Sand and Gravel Co., Seattle, Wash.

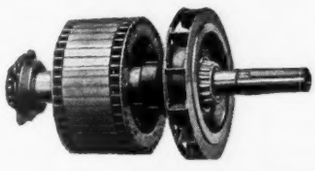


Made in Squirrel Cage and Slip Ring Types. 2 H. P. to 150 H. P.—40°C. Ratings

Internal Protection at Low Cost

Inlet and outlet manifolds can be located independently of each other, in any 90° position to suit plant layout. Free circulation of clean, cool, dry air, under precise control is assured.





The powerful shrouded fan is capable of drawing ventilating air through long pipes and discharging at same distance if necessary. The compact Timken mountings promote effective application of air.

PRICES ONLY SLIGHTLY HIGHER THAN STANDARD OPEN TYPE MOTORS

Dirt, corrosive gases or other destructive agents cannot get in to harm these highly protected self-ventilated Allis-Chalmers motors. Fire hazards also are overcome.

The bearings themselves are the most highly wear-resistant in use today—Timken Bearings, with full thrust and shock capacity, as well as greater radial capacity—free from all possible friction—running months at a time on the same grease—and permitting refined, compact construction.

Allis-Chalmers electric steel frames, indestructible rotors, extra-sealed insulation and other characteristic superiorities also contribute to permanent endurance and economy.

Never has every possibility of motor wear been so completely canceled. Plant efficiency goes up accordingly wherever these motors are installed. They show again why Allis-Chalmers motors command consideration in every motor purchase today.

ALLIS-CHALMERS MANUFACTURING CO., MILWAUKEE
District Sales Offices in all Principal Cities

ALLIS-CHALMERS MOTORS

W. J. Henry, formerly connected with the Harnischfeger Corp., has joined the Buhl Co. of Chicago, Ill., makers of portable air compressors, as assistant sales manager.

John C. Kennerly will be superintendent of the Orangeburg county concrete pipe plant in place of W. A. Moore, who is retiring because of failing health.

Harry A. Neal, owner of the United States Equipment Co., Lyons, Ill., concrete block manufacturers, was seriously burned about the head when a gasoline blow-torch exploded at the plant.

A. Anable, for several years connected with the equipment sales department of the Dorr Co. of New York, has been appointed director of publicity.

E. J. Strock, superintendent of the Colorado Portland Cement Co., with headquarters at Portland, Colo., resigned July 28. His family are at present in California and he is considering locating there.

F. M. Traynor, formerly vice president and general manager of the T. E. Schilling Co., building supply dealers at Miami, Fla., will head the sales force of the Florida Portland Cement Co., Chicago, Ill., which is planning to start the operation of the $5,000,000 cement plant on Hooker's Point the first part of August.

Obituaries

Raymond Stone, a bookkeeper for the Greenville Gravel Co., Greenville, Ohio, was drowned July 11 in a small lake at one of the companys' plants.

H. A. Keener, president of the Keener Sand and Clay Co., Columbus, Ohio, died of heart disease July 18. He was 57 years old and had conducted the company's business in Columbus for 20 years. He had not been in good health since last October, when he suffered a paralytic stroke.

John Carew, vice president of the Holton Brick Co., Terra Cotta, Ont., and president of the Canada Sand Lime Brick Co., Ltd., West Toronto, died July 19 at Lindsay, Ont. Mr. Carew was 65 years old, was a former M. P. P. for South Victoria and a prominent leader in Landsay's municipal affairs, sports, and in Rotary.

Louis Manegold, president of the Manegold Stone Co., Milwaukee, Wis., died July 14. He was very well known in the rock products industry of Wisconsin as he had been in the crushed stone business in Milwaukee for 47 years, having entered the business with his brother, the late August F. Manegold, in 1880. He was 66 years old.

H. O. Seymour, director of the Chain Belt Co., Milwaukee, Wis., died of heart failure July 23 at his country home, Lake Geneva, Wis. Mr. Seymour was director of the Chain Belt Co. since 1918. He was also president of the First Wisconsin Trust Co., executive vice president of the First Wisconsin National Bank, and vice president of the First Wisconsin Co., all of Milwaukee.

Manufacturers

Harbison-Walker Refractories Co., Pittsburgh, Penn., recently purchased a tract of land in Baltimore, Ohio, upon which it will erect a large firebrick plant.

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y., announces the removal of its Seattle branch office, service department and warehouse, effective August 1, 1927, from 119 Jackson St. to 1743-47 First Ave., S., Seattle, Wash.

Lincoln Electric Co., Cleveland, Ohio, announces that the Missouri district office has been moved from St. Louis to 1003 Davidson Bldg., Kansas City, Mo., with Robert Notrest in charge, who will also handle the St. Louis district, dividing his time between the two cities. A branch office has also been established at 220 Nicholas Bldg., Toledo, Ohio, with A. H. Homrighaus, formerly in charge of the Missouri district, handling this territory.

Milwaukee Corrugating Co., Milwaukee, Wis., announces that on or about October 1 its Chicago, Ill., branch will be moved to the corner of Western Ave. Blvd. and W. 43rd St. The new location will have more space, being 90x200, and will also afford ideal shipping facilities, as the property is bounded on the east by the Chicago Junction Railway's right-of-way, while a switch track connects with the Pennsylvania Railroad. The building will house the warehouse and sales offices.

Power Specialty Co. and **Wheeler Condenser and Engineering Co.** of New York recently announced their consolidation as the Foster Wheeler Corp. No change in management will be made. The new officers will be those of the old companies, as follows: J. J. Brown, chairman of the board of directors; Pell W. Foster, vice chairman and treasurer; L. B. Nutting, president; John Primrose, vice president; H. S. Brown, vice president; W. E. Dowd, Jr., vice president; David McCulloch, secretary and general manager, and W. F. Keenan, Jr., chief engineer.

The new corporation will have no securities prior to 35,000 shares of preferred stock and 194,000 shares of no par value common stock. The combined assets are approximately $12,000,000.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Okeh! a direct mail folder describing the "Bulldog," gyratory washer. TRAYLOR ENGINEERING AND MFG. CO., Allentown, Penn.

American Slackline Cableways, "Three in One," a direct mail bulletin containing specifications and data on slackline cableways. R. H. BEAUMONT CO., 319 Arch Street, Philadelphia, Penn.

Dragline Buckets, Bulletin No. **D-1**, giving details, weights and specifications of "P & H" dragline buckets. HARNISCHFEGER CORP., Milwaukee, Wis.

Herculean Steel Posts, Pamphlet No. **One**, containing descriptions, data and uses for high carbon steel flanged leg channel sections and posts. SWEET'S STEEL CO., Williamsport, Penn.

"New Water Supply System at Tampa, Florida," reprint of a paper read before the New England Water Works Association by Nicholas S. Hill, Jr., consulting engineer, New York City, describing the problems, plans, methods and description of equipment employed, with special reference to the De Laval installations made in the new water works system at Tampa, Fla. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Sullivan "Turbinair" Portable Hoists. Bulletin No. **76F** containing descriptions, applications, data and specifications on "Turbinair" Types "HA-3" and "HA-2" single drum and Type "DHA-2" double drum portable compressed air hoists. Bulletin No. **81N**, Class "DH-361" **Clay Spaders**, gives description, details and illustrations of adaptations for the compressed air clay digging tool. Bulletin No. **83F** on Types "WK-312" and "WK-314" gasoline engines; also Types "WK-322" and "WK-324" electric-motor driven portable air compressors, with specifications, details of design and various types of mountings. SULLIVAN MACHINERY CO., 30 Church St., New York.

Production of Bauxite in United States in 1926

THE production of bauxite in the United States in 1926 was 392,250 long tons, valued at $2,415,200, an increase of 24% in quantity and 21% in value as compared with the domestic production of 316,540 long tons, valued at $1,988,250, in 1925, according to a statement prepared by James M. Hill, of the Bureau of Mines, Department of Commerce.

The production of bauxite in the Arkansas field was 371,570 long tons in 1926, an increase of 25% as compared with 1925. The eastern field, including Georgia and Tennessee, produced 20,680 tons, an increase of 2% as compared with 1926. No bauxite was produced in Alabama or Mississippi in 1926.

The following is a statement of domestic bauxite sold by producers to industries in 1924 to 1926, inclusive, in long tons:

Year	Aluminum	Chemicals	Abrasives, refractories & cement	Total
1924	225,780	54,870	66,920	347,570
1925	173,040	67,420	73,980	314,440
1926	241,850	77,960	72,440	392,250

Domestic bauxite was quoted throughout the first half of the year as follows: Crushed and dried, $5.50 to $8.50; pulverized and dried, $14; calcined and crushed, $17 to $20 a long ton, f.o.b. shipping point. Beginning with August, quotations were changed to read "No. 1 chemical ore, over 60% Al_2O_3, less than 5% SiO_2 and less than 2% Fe_2O_3," and the price quoted was $8 a ton f.o.b. Georgia mines the balance of the year. Domestic producers reported value f.o.b. shipping point at $5 to $8 a ton, the average for the whole domestic production being $6.16 a long ton.

Imports of bauxite in 1926 amounted to 281,644 long tons, valued at $1,187,497 (an average of $4.22 a ton), a decrease of 20% in quantity as compared with imports in 1925. Imports were chiefly from the Guianas and Dalmatia, though some French bauxite was imported. Imported bauxite is used chiefly by the chemical and cement industries on the eastern seaboard. Quotations on foreign bauxite were: Dalmatia, low silica, $5 to $6.50; Istrian, $5.50 to $7; and French red, $6 to $7.50 c.i.f. a metric ton.

Exports of bauxite, including bauxite concentrates (alumina), in 1926 totaled 87,770 tons, valued at $4,741,260 ($54.02 a ton), an increase of 12% in quantity as compared with exports in 1925. Exports were largely to Canadian and Norwegian aluminum plants.

Sales of Phosphate Rock in 1926

THE total quantity of phosphate rock sold by producers in the United States in 1926 was 3,209,976 long tons, valued at $10,893,800, according to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by producers. The figures indicate a decrease of 8% in quantity and of 6% in value as compared with 1925.

The quantity and value, by states, of the various kinds of phosphate rock mined in the United States and sold in 1926, were as follows:

	Long tons	Value
Florida:		
Hard rock	116,264	$465,308
Land pebble	2,591,943	8,218,200
	2,708,207	8,683,508
Idaho:		
Western rock	33,113	133,020
Tennessee and Kentucky:		
Blue and brown rock	464,192	2,048,272
Wyoming:		
Western rock	4,464	29,000

Imports of phosphate rock in 1926 were 17,378 long tons, valued at $192,611, or more than 6 times as great in quantity and 5 times as great in value as those of 1925. Exports amounted to 749,163 long tons, valued at $4,440,074, a decrease of 14% in quantity and 22% in value.

Refractories Institute

IT is announced that the fall meeting of the American Refractories Institute will be held at the Clifton Hotel, Niagara Falls, Ontario, Canada.